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ABSTRACTS OF TUBERCULOSIS

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Spontaneous Desensitization.—It is a well known fact, demonstrated by many observers, that guinea pigs inoculated with tubercle bacilli of attenuated virulence lose their cutaneous tuberculin sensitivity after a long period. It has also been shown, particularly by Willis, that guinea pigs which have lost this sensitivity acquired by inoculation with avirulent tubercle bacilli become skin positive to tuberculin as early as the fourth day following a reinfection with virulent tubercle bacilli. Control guinea pigs inoculated the same time with the same organisms developed a cutaneous sensitivity to tuberculin much more slowly. A series of experiments were made to reaffirm this phenomenon of the reappearance of tuberculin allergy in guinea pigs which had had primary infections with attenuated strains of tubercle bacilli. In the first experiment a guinea pig was used which had been inoculated with BCG twenty-six months previously. This animal had developed a positive cutaneous reaction to tuberculin on the fourteenth day following the initial infection and had become spontaneously desensitized to tuberculin nineteen months later. Following a reinfection with virulent tubercle bacilli the guinea pig developed a necrotic reaction to tuberculin four days after the reinoculation. Two control guinea pigs inoculated at the same time with the same strain of bacilli did not develop a cutaneous sensitivity until two weeks following the experimental infection. The second experiment consisted in the reinfection with virulent tubercle bacilli of two guinea pigs originally infected with an avirulent lupine strain of tubercle bacilli and completely desensitized to tuberculin sixteen months after the primary infection. These animals likewise became sensitive to tuberculin four days following the reinfection while control guinea pigs became sensitive much later. The third experiment was performed on 5 guinea pigs which had been inoculated with BCG and had become tuberculin negative nine months after the inoculation. A reinfection with virulent bacilli of these animals became responsible for the reappearance of the tuberculin allergy four days later. This phenomenon, originally described by Willis, becomes of enormous importance when applied to the disappearance and reappearance of cutaneous tuberculin sensitivity in man. This reappearance of the tuberculin allergy may be explained as a bacillary reinfection of old cases of latent tuberculosis. If the phenomenon of accelerated sensitivity exists in man as in the guinea pig, it is evident that the ante-allergic periods of nonreactivity to tuberculin may be proportionately shor-

tened. This may be difficult to observe unless the tuberculin study is meticulously made.—*Y a-t-il accélération de la réapparition de l'allergie chez les cobayes réinfectés après désensibilisation spontanées, A. Saenz & G. Canetti, Compt. rend. Soc. de biol., March, 1940, 133: 352.*—(*M. T. W.*)

Immunity and Tuberculosis.—On the basis of many years of animal experimentation and observations on humans Bruno Lange sketches the pattern of immunity in tuberculosis. His viewpoint deviates in many respects from those of Marfan, Behring, Roemer, and also from that of Ranke. The immunity of the infected organism against reinfection from without must be recognized as proven. It also is certain that specific allergy brought about by the infection influences the whole course of the tuberculous disease. In animal experiments as well as in humans the spread of small numbers of bacilli within the body calls forth evidence of an immune response, whereas that of large numbers calls for the evidence of an allergic response. The successful protection against exogenous or endogenous superinfection is certainly a noteworthy performance of the forces of specific immunity. The acquisition of the immunity is, however, dearly bought, as observations on the parallelism between the degree of the immunity and the severity of the tuberculosis show. The relatively high immunity which the tuberculous patient acquires where natural immune forces are low is of little protection to him. On the other hand, he overcomes his tuberculosis by natural powers of resistance, in spite of the fact that immunity continually decreases as healing progresses, for the course of the tuberculous process is determined not by the immunity which he has acquired from his infection but by his individual constitutional powers of resistance. Upon these depend whether he will remain sick or well after the infection, whether he will develop joint tuberculosis, generalized miliary tuberculosis, lupus or phthisis, whether the disease will progress, whether it will become acute, chronic or stationary. The limits of immunity to tuberculosis also define the place of vaccination against tuberculosis. This can be undertaken only with tubercle bacilli of low virulence and consequently cannot be expected to do more than delay the earliest strides of naturally virulent infection. Such a delay of the infection might have a definite advantage in earliest childhood, since later the child's natural powers of resistance increase from year to year. Great success with vaccination cannot be hoped for. It will play only a modest rôle in the fight against tuberculosis.—*Die Immunität bei Tuberkulose, B. Lange, Beitr. z. Klin. d. Tuberk., 1939, 93: 381.*—(*R. K.*)

Desensitization in Tuberculosis.—A high degree of allergy resulted from the injection of a relatively small number of killed tubercle bacilli. Sensitivity to tuberculin gradually disappeared spontaneously and desensitization could be accomplished by repeated injections of Old Tuberculin. The relationship of desensitization to the course of tuberculosis was studied. Guinea pigs were sensitized with heat-killed tubercle bacilli, desensitized by repeated injections of tuberculin, infected with virulent tubercle bacilli and the desensitization continued. In the desensitized animals the survival time was longer, extent of disease was less, and colonies of tubercle bacilli cultured from the lungs were fewer than among control nondesensitized animals. Injections of Old Tuberculin in unvaccinated animals subsequently infected with virulent tubercle bacilli had no effect on the later course of the disease. However, if the desensitization was continued after the infection with virulent tubercle bacilli, the course of the disease led to a less rapid and less extensive tuberculous process. Partial desensitization of vaccinated animals was noted following repeated injections of concentrated glycerol broth. Continued desensitization with this following infection with virulent tubercle bacilli resulted in a longer survival time and less severe lesions than found among the controls, but more extensive than among animals desensitized with Old Tuberculin. Sensitization is probably never completely abolished, and returns when desensitization is stopped. The survival time of the animals and extent of disease were in inverse proportion to the degree of tuberculin sensitivity at the time of infection. The de-

gree of caseation was greatest among those who had a fairly high degree of allergy or none. Desensitization may in part be nonspecific. The authors suggest that a slight or moderate degree of allergy at the time of infection is favorable for survival, whereas a high degree of allergy is worse than no allergy at all. Repeated injections of tuberculin set up inflammatory focal reactions and thus retarded dissemination. These studies can be interpreted as proof that allergy and immunity are unrelated or that a controlled degree of allergy is of value in increasing resistance to tuberculosis.—*The Effect of the Desensitization of Tuberculous Guinea Pigs, G. S. Wilson, Herta Schwabacher & Irene Maier, J. Path. & Bact., January, 1940, 50: 89.*—(*H. J. H.*)

Antibody Formation in Tuberculous Lesion.—Whether the appearance of antibody at the site of introduction of antigen is due to a local production of antibody, or whether it is due to a local accumulation of antibody, requires further elucidation. In the present series of experiments normal rabbits were injected intracutaneously with heat-killed tubercle bacilli suspended in paraffin oil and the time of appearance of complement fixing antibodies at the site of inoculation as well as in the blood serum was noted. The tubercle bacilli (bovine) were killed in an Arnold sterilizer, dried and suspended in the paraffin oil. Three suspensions were prepared containing 0.2 mg., 0.1 mg., and 0.05 mg. of bacilli per 0.2 cc. of the oil respectively. Each rabbit received simultaneous intracutaneous injections of 0.2 cc. of each of the above suspensions. The animals were tuberculin tested at various intervals. Two days before death an intracutaneous injection of 0.2 cc. of paraffin oil was given. At varying intervals after injection rabbits were sacrificed and the areas injected with the bacilli, the tuberculin and the paraffin oil were then excised. An extract of each of these tissues was made by suspending one part by weight of tissue in five parts of physiological salt solution. A complement fixation titration was performed on the supernatant fluid of each extract. The serum of each rabbit was also examined one or more times in this manner. In a small series of rabbits stronger suspensions of heat-killed bacilli in oil were used. This increase in dosage failed to induce a more rapid formation of antibody or a higher titre in the local lesion. Another series of rabbits was inoculated subcutaneously with heat-killed tubercle bacilli in oil and, at the same time, each animal received 0.2 cc. of codliver oil injected intracutaneously. This was done in an attempt to produce an inflammation in the skin comparable to that caused by the bacilli in oil and to determine if antibodies were fixed at the site of this nonspecific inflammation. In a final series of rabbits the appearance of antibody in the lesion produced by the reinjection of 0.2 mg. of heat-killed tubercle bacilli in paraffin oil into a sensitized animal was investigated. Complement fixing antibody in animals injected with heat-killed tubercle bacilli in oil appears earlier in the lesion at the site of injection than in the blood serum. Complement fixing antibody in an extract prepared by suspending one part by weight of tissue from the local site in five parts of saline is in general in higher concentration than in the blood, for a period of approximately three weeks following injection. After this time the serum may show the higher titre. The titre of antibody at the site of injection tends to increase with the quantity of heat-killed bacilli injected into the skin, up to a definable maximum. No evidence was found to support the opinion that local accumulation of antibody was caused by fixation of antibody contained in the serum and produced elsewhere in the body, for extracts of lesions produced by the injection of paraffin oil, Old Tuberculin, and codliver oil showed no demonstrable antibody, or at most a very low titre, even when the serum titre was high. After reinjection of heat-killed tubercle bacilli in oil into rabbits with antibody in the serum, antibody did not appear in the local lesion any earlier than in normal animals similarly injected. These observations give evidence that antibody is formed in the skin at the site of injection of tubercle bacilli.—*Antibody Formation in a Tuberculous Lesion at the Site of Inoculation, J. O. Westwater, J. Exper. Med., April 1, 1940, 71: 455.*—(*J. S. W.*)

Pulmonary Reactions in Anaphylaxis.—The effect of repeated injections of antidiphtheritic horse serum over a period of four to seven months in rabbits is presented. The author was interested in pointing out the more permanent lesions in the various organs and tissues as evidence of the existence of an anaphylactic state rather than the fleeting reactions often observed by others after a single provocative injection. After sensitizing the animals with several subcutaneous injections, a series of 10 provocative injections were administered at intervals of ten to fifteen days using either the intratracheal, the intravenous, the subcutaneous or the intraperitoneal route. The pulmonary lesions noted after the introduction of the serum were of 3 types: necrotic, indicating a reaction of a sensitized animal to the injection; exudative; and lastly the proliferative type, which the author considers due in part to the last provocative injection and in part to the previous intratracheal injections. The local phenomenon characterized by oedema, exudation, granulocytic infiltration, proliferation of the alveolar cells, an intense interstitial reaction and marked vascular changes is analagous to the Arthus phenomenon. The study of these lesions shows that the histopathological picture is modified by the repeated provocative injections and the duration of these changes is prolonged up to at least fifteen days. The animals treated by the intraperitoneal route failed to show any pulmonary lesions. Those animals injected subcutaneously with the provocative doses of serum presented localized lesions analogous to the Arthus phenomenon and only 1 of 3 animals showed pulmonary changes similar to that noted in the first group. Following the series of provocative injections by the intravenous route the interalveolar septa were seen to be markedly thickened by the infiltration of histiocytes, fibroblasts and lymphocytes. The septal capillaries were rarely congested but were greatly thickened by an intense panvasculitis with hyaline thrombosis. Here again the persistent alterations noted were due to the repetition of the provocative injections. The lesions noted above in the lungs of the rabbits injected by the intratracheal and the intravenous routes, except for their intensity, are superimposable, and the author states that these reactions are due to a local action of the antigen which reaches the lung in a greater concentration as compared to the other two routes. However, the antigen injected subcutaneously or intraperitoneally may give a general or pulmonary reaction after lymphatic or vascular dissemination. The lesions noted were not exclusively due to anaphylaxis, but seem to represent a more general phenomenon which is observed in any organism modified by the introduction of any antigen. These lesions had no relation to the violence or intensity of the anaphylactic shock. These changes seem to represent a local reaction of the neutralization of the injected antigen and a more general reaction testifying to the formation of antibodies. Although these anatomical reactions have no specificity from the aetiological viewpoint, the author feels justified in the use of the term "anaphylactic inflammation."—*Reactions pulmonaires dans l'anaphylaxie, A. Garipuy, Ann. Inst. Pasteur, August, 1939, 63: 190.*—(*M. A. B.*)

Tuberculin Reaction.—In 1932, following studies in the guinea pig, Dienes and Mallory reported that although the early stages of the anaphylactic skin reaction showed an intense polymorphonuclear leucocytic response, the tuberculin reaction was characterized from the beginning by a predominance of mononuclear cells. In the initial stages of any inflammatory reaction a predominately mononuclear response is, however, unique. Because of the importance of this observation of Dienes and Mallory, the author has attempted to repeat their experiments, using small amounts of tuberculoprotein and animals of low sensitivity, as in the original tests. Adult male guinea pigs were rendered hypersensitive by inoculation with heavy doses of human type tubercle bacilli. After the appropriate interval of eight to thirty-five days the animals were injected intracutaneously at different sites with 0.1 cc. of the desired dilution of the tuberculin and of the control solution (concentrated medium in the case of OT). The skin sites were removed at various intervals, cut into blocks, fixed, sectioned and stained with haemotoxylin and eosin. At the site of maximum

reaction 200 cells were counted differentially. Injections of tuberculin into normal animals was also carried out. Where tuberculoprotein was employed the dosage was similar to that of Dienes and Mallory. The first series consisted of 4 animals which had been infected five weeks before. These received 0.1 mg. of OT and its control as described. The sites were examined two to twenty hours after the injection. In the second to eighth hours of the reaction the cellular reaction was predominantly polymorphonuclear (60 to 80 per cent). Later the number of these cells diminished, but even by the twentieth hour the cellular response still showed a preponderance of granulocytes. The control reactions gave a similar cell response, but with a less intense reaction. Series II consisted of 4 guinea pigs, 2 having been infected four weeks before, while 2 were normal. These were injected with stronger doses (1.0 and 3.0 mg.) of OT and appropriate control solutions. The skin was removed four to six hours after the test. The results in both infected and normal animals were similar to those obtained in Series I. Series III consisted of 4 guinea pigs. Each was injected with 3 mg., 0.3 mg. and 0.03 mg. of OT and control solutions. The skin sites were removed from each four and eight hours later. In order to have animals of slight sensitivity guinea pigs were skin-tested and killed on each of the eighth, tenth, twelfth and fifteenth days following infection. In all of these the percentage of polymorphonuclear cells was always much greater than that of the mononuclears. In the fourth series 2 guinea pigs were used, 1 infected two weeks and the other four weeks before the skin testing. In this series PPD was substituted for OT in appropriate dosage. At three, six and nine hours the granulocytes here too markedly predominated. The results of this study do not confirm the findings of Dienes and Mallory. The cellular response in the early stages of the skin reaction was found to be predominantly polymorphonuclear and not mononuclear.—*Studies on the Cellular Response in the Early Stages of the Tuberculin Reaction, R. H. Follis, Jr., Bull. Johns Hopkins Hosp., April, 1940, 66: 245.*—*(J. S. W.)*

Focal Allergy and Cutaneous Allergy.—It has already been pointed out that intracutaneous tuberculin reactions are frequently negative as often in adults living in infested surroundings as in those adults who had either tuberculous lesions or sequelae. These have been termed post-primary anergies, as a matter of differentiation from those reactions of individuals supposedly noninfected with the tuberculous virus. At the same time, in surveying the state of twenty-one post-primary anergic patients, the opportunity arose to observe in some of them the appearance of a tuberculous syndrome of the haematogenous type comparable to the syndrome which appeared in the Senegalese, free from all previous contact with tuberculosis. Following these observations, the question arose whether this cutaneous anergy in patients with tuberculous lesions or sequelae might not be regarded as a test of resistance to the infection. Did this cutaneous anergy follow a focal anergy in an obligatory manner? Or, on the contrary, was the disappearance of the reacting sensitivity of the reticulo-endothelial tissue of the skin able to coexist in an independent manner, dissociated from the focal allergy? Several investigators have shown that exposure to solar rays markedly diminished the tuberculin reactions in healthy children. Similarly it has been shown that in tuberculous guinea pigs cutaneous sensitivity was diminished in regions exposed to the sun and less markedly diminished in nonexposed areas. A series of experiments were made in an attempt to demonstrate this dissociation of focal and cutaneous reaction to tuberculin. Patients with tuberculous laryngitis were chosen for this experiment because the anatomical location of the larynx permitted direct and complete examination of the perifocal tuberculin reaction. Seventy-two patients with typical tuberculous laryngitis were studied together with 30 control patients, none of whom had any evidence of tuberculous involvement of the larynx. Intracutaneous tuberculin tests were made with varying dilutions of tuberculin. Cutaneous and focal (laryngeal) reactions were observed after one hour, twenty-four and forty-eight hours and in some cases three days. In the tuberculin-negative cases, tuberculin tests

were repeated at intervals of ten, twenty and thirty days and as long as eight and ten months after the first test. In the 72 cases of laryngeal tuberculosis, 35 manifested perifocal reactions and 55 had cutaneous reactions. In 25 cases the tuberculin allergy was manifested by a double reaction, that is, both focal and cutaneous. In 30 cases there was a dissociation of the allergic phenomenon; in 17 cases a cutaneous anergy accompanied a focal allergy; in 24 cases typical cutaneous reactions were observed. The inverse dissociation of the tuberculin phenomenon (cutaneous anergy and focal allergy) was observed in 14 per cent of the cases. But if the 9.7 per cent of the cases with double anergic manifestations were added there would be a total of 23.7 per cent of the cases which presented cutaneous anergy. This study presents a new point of view of the subject of infection and immunology in tuberculosis.—*Dissociation entre l'allergie focale et l'allergie cutanée (anergie) chez l'adulte tuberculeux, I. Tetu & M. Blechmann, Compt. rend. Soc. de biol., March, 1940, 133: 495.*—(*M. T. W.*)

Serum in Anergic Tuberculous Patients.—A former study made on precipitation and flocculation reactions with blood serum *in vitro* with various extracts derived from tubercle bacilli showed negative, inconstant or paradoxical results. Tuberculin, methyl and acetone extracts were used. The methyl extract alone gave enough precipitation reactions with certain sera from tuberculous patients that its utilization for complement fixation tests might be foreshadowed. On the other hand, the remarkable parallelism of tuberculin cutaneous reactions with intracutaneous histamine reactions was observed and appeared to demonstrate the fact that the Pirquet test was a local vasomotor reflex phaenomenon, dependent at the time on the neurovegetative tonus and on a substance that brought it into play. A preliminary experiment was made attempting to activate the serum of tuberculous patients, not *in vitro*, but *in vivo*, by intracutaneous inoculation into healthy nontuberculous guinea pigs. In this way an injection could be made to produce, according to the case, a positive or negative cutaneous reaction to tuberculin. A series of serum inoculations were made into guinea pigs, using serum from both allergic and anergic tuberculous patients. These animals were then tuberculin tested. In general the serum of the tuberculous patients who were anergic to tuberculin showed more active serum than the serum of the tuberculous patients who were skin-positive to tuberculin, as evidenced by the intracutaneous reactions to tuberculin in the animals of the passive transfer. This phaenomenon could not be explained with certainty. It was not dependent apparently upon the antigen-antibody reaction but on an allergy which was not dependent upon the usual conditions. All this might be explained as a state of the serum of the allergic tuberculous patient containing a substance "X", inactive for the patient, but which when combined with tuberculin gave rise to a product (analogous to histamine) which was responsible for the positive cutaneous tuberculin reaction in the guinea pig. If the tuberculous patients reacted positively to the introduction of tuberculin (exogenous tuberculin), their sera did not directly provoke this phaenomenon in healthy, nontuberculous patients contained, at the time, tuberculin (endogenous tuberculin) plus the substance "X", or perhaps the product from which it was derived. These patients, more or less subdued by this veritable intoxication (perhaps responsible for the tuberculous cachexia), no longer reacted to exogenous tuberculin, but on the other hand, their serum contained the substance necessary for provoking reactions in normal guinea pigs. Further experimentation without doubt will bring about clarification of these points.—*Sur une propriété du sérum sanguin des sujets tuberculeux anergiques a la cuti-réaction tuberculinique, A. Rouslacroix & J. Brahic, Compt. rend. Soc. de biol., March, 1940, 133: 486.*—(*M. T. W.*)

Tuberculin Patch Test.—A historical review of the evaluation of the Vollmer (Lederle) tuberculin patch test is given. The method of applying the test is discussed briefly. A study of one hundred tuberculin-sensitive cases is presented, correlating the patch test with the intracutaneous tuberculin tests with solutions of PPD. The patch test is shown to be more

sensitive than the intracutaneous test with first strength solution of PPD. In this small series of patients the efficiency of the test with first strength solution of PPD is rated at 78 per cent, the efficiency of the patch test at 89 per cent, and that of the test with solution of second strength PPD at 100 per cent. The results obtained give further basis to the belief that the patch test may be used in preference to the intracutaneous test with first strength solution of PPD. The patch test, in our experience, is definitely inferior to the intracutaneous test with second strength solution of PPD. The tuberculin patch test is as sensitive when applied in the interscapular area as it is when applied over the sternum, and there is less chance of the child's removing the patch. No significant reactions, other than local phenomena, were noted when the patch test was used.—*The Vollmer Tuberculin Patch Test, Evaluation of Its Relative Sensitivity, J. G. Hughes, J. Pediat., February, 1940, 16: 171. (From the author's summary)*—(*M. B.*)

Mantoux and Patch Tuberculin Tests.—Because the Mantoux method has some disadvantages in the tuberculin testing of school children, a comparative study was made on 712 children using the intracutaneous test and also the Vollmer patch test in each case. The intrascapular area was used for the patch test. The Mantoux was repeated once in stronger dilution if initially negative. There was complete correlation between the Mantoux and patch tests in 624 children tested, or in 87 plus per cent. Sixty-seven cases, or 9 plus per cent, were positive to the patch test only, while only 21 cases, or 2 plus per cent, were positive to the Mantoux test only. It can be concluded that the patch test is as reliable as the Mantoux, and because of the objections often met with in the use of the latter, should be the method of choice in large scale tuberculin testing for children.—*The Tuberculin Patch Test and the Mantoux Intradermal Test: A Comparative Study on Seven Hundred School Children, A. J. Pearse, R. I. Fried & Vera A. Glover, J. A. M. A., January 20, 1940, 114: 227.*—(*G. L. L.*)

Tuberculin Patch Test.—Two hundred twelve children, who had previously reacted positively to a 1:1000 dilution of Old Tuberculin, were tested with the Vollmer Patch Test and the first strength Purified Protein Derivative. Two hundred two, or 95.1 per cent, showed a conformity in positive reactions between the 1:1000 dilution Old Tuberculin and the Vollmer Patch Test. One hundred eighty, or 84 per cent, showed a conformity in positive reactions between the 1:1000 dilution Old Tuberculin and the first strength Purified Protein Derivative. The greatest number of negative reactions to the first strength Purified Protein Derivative occurred in the children who had had a positive reaction to Old Tuberculin an appreciable length of time before the testing. First strength Purified Protein Derivative was not as sensitive as the Vollmer Patch Test when the cases were tested a year or more after an original positive reaction to Old Tuberculin (1:1000 dilution). The Vollmer Patch Test was a satisfactory case-finding aid.—*The Vollmer Patch Test as a Routine Procedure, J. D. Craig & L. A. Scheuer, Arch. Pediat., March, 1940, 57: 177. (From the author's summary)*—(*M. B.*)

Dangers of Tuberculin Tests.—Constitutional reactions may follow Mantoux tests. In the series studied by Lincoln, Raia and Gilbert at Bellevue Hospital, they were much more common after the age of four years and more common when 0.1 mg. was given than with a test of 0.01 mg. It is also evident that focal reactions may occur around existing tuberculous foci. It has been difficult to demonstrate these in the lung by means of the roentgen ray, possibly because the Mantoux test in practice usually precedes the roentgenogram. However, focal reactions in the pleura and meninges, in the superficial lymph nodes, the sclerae and the skin have been observed. Local severe tuberculin reactions leading to vesiculation or necrosis are more frequently seen in the groups five years of age and older than in infants and occur much more frequently with 0.1 mg. than when 0.01 mg. is given. In the older groups severe local reactions are almost invariably present when there is a focal or constitutional reaction. In infancy general or focal reactions may be seen when the local reaction is not necrotic and oc-

casionally when it is vesiculated or necrotic but small. Tuberculin is safer to use in well stabilized, even though extensive lesions, than in progressive or active lesions, however small. Since at least 75 per cent of ambulant cases infected with tuberculosis will respond to the initial dose of 0.01 mg. and the risk of severe reactions is so much less with this dosage than with larger amounts, it would seem logical to urge the general adoption of this dose as the maximum initial test. Since it has been shown that patients who have had progressive primary tuberculosis only rarely develop negative tuberculin reactions during childhood, it would seem reasonable not to repeat tuberculin tests which have been positive, since further testing is of no conceivable use in the care of the child. If it could be made feasible, some method should be devised whereby a child who has had a positive Mantoux test could be branded in some way to preclude further testing at least until his disease had healed. Moreover, we should go even further and suggest that when tuberculosis is suspected because of a history of contact with a case, or for any other reason, roentgenography, or at least fluoroscopy, might well precede a Mantoux test. The tuberculin test is so simple to do that it has become popular as a routine measure. Many hospitals perform routine Mantoux tests on all patients admitted; some convalescent homes require the tests before accepting a child; practically all tuberculosis sanitaria repeat tests on children admitted with the history of previous positive tests. Most case-finding projects make no attempt to find out whether previous tests have been made. Many tuberculosis clinics and chest clinics on pediatric services repeat tests that have been reported as positive. We have seen children who have had as many as ten positive Mantoux tests within less than two years. We wish in no way to detract from the great value of tuberculin as a help in case finding and in differential diagnosis, but a Mantoux test should be regarded as a help in diagnosis, not essential when the diagnosis has been definitely established. And above all it is important to remember that when a Mantoux test is done, material is injected which is potentially dangerous and able to create an undesirable reaction around unstabilized tuberculous foci.—*The Potential Dangers of Tuberculin Tests, Edith M. Lincoln & W. Grethmann, J. Pediat., November, 1939, 15: 682. (Author's summary)*—*(M. B.)*

Miniature Films.—The attitude of the modern tuberculosis worker toward X-ray films in the case-finding program is determined by the following facts. Tuberculosis is still the commonest cause of death between the ages of fifteen and forty. Not over 5 per cent of the cases in routine general practice are diagnosed in the minimal stage while 80 per cent are far advanced. Therefore, surveys are needed to find early cases. Such surveys have so progressed that now 30 per cent of the cases discovered are minimal. X-ray examination is one of the most important factors in the diagnosis. More than one worker would discontinue tuberculin testing if X-ray films could be taken in all cases; but most tuberculosis workers are handicapped by lack of funds. They would, however, have adequate budgets if skin testing could be omitted and X-ray negatives could be reduced in cost. Thus tuberculosis workers are ready and anxious to reorganize the entire case-finding program as soon as a cheap and efficient substitute is found for the present set-up. This report is made with this situation in mind. The production of film miniatures by focusing down the image on a fluorescent screen is the basis of this paper. This was made possible by the use of a special fluorazure screen which was mounted in front of a yard long light-tight box tapered down to receive a camera. A lead plate glass was placed in back of the screen to protect the film from X-ray fog. The exhaustive work of Charlton and Dietz on the sensitivity of rapid films to light from fluoroscopic screens revealed that the ordinary X-ray film was particularly sensitive to the blue light of the fluoride or fluorazure screen and had excellent working qualities. After long experimentation with regular film ranging from 35 mm. to 4 by 5 in., and using lenses of varying speeds and various exposure times, it was determined that films to be satisfactory should be not less than 3 or 4 in. in diameter, that the film-screen distance should be not less than 4 ft., the exposure time should be not more than one-tenth of a second,

and that a much faster lens was needed. Therefore, a specially built lens with a speed of f. 1.5 which would focus a flat field on a film area 3¼ in. square was borrowed. A series of chest films were obtained which seemed adequate. A similar lens was then ordered which was adapted to the flat field of the screen and was painstakingly permanently mounted and focused. A series of normal chest miniatures were made and found adequate following which standard size and miniature films on a series of pathological cases were made. These miniatures were found to be quite satisfactory. Where such miniatures could be used the saving represents the difference between $650 per thousand and $50 per thousand. Having screened out the infected case, the cost of working it up on standard stereoscopic films would be the same as now. Other economies would also be effected in dark room processes, filing and decrease in storage space. It now remains for some group to employ this method in a practical field survey.—*Miniature Films in Chest Surveys, H. E. Potter, Radiology, January, 1940, 34: 62.*—(*G. F. M.*)

Roentgenograms of 3,179 Office Employees.—Between the years 1926 and through 1938, 3,179 male and female Home Office clerical employees of the Metropolitan Life Insurance Company were examined by serial roentgenograms. Those under thirty-five years of age were examined at two-year intervals and those over thirty-five years at three-year intervals. About 60 per cent of the group had additional chest films for clinical reasons. The entire group was divided into: those showing a negative chest, those with an apparently healed primary complex, and those having a lesion requiring further study. There were 2,536 cases showing an average healthy, or negative, chest and 449 cases with a healed primary lesion. Tuberculosis developed in 50 cases among those in the first group and adult type tuberculosis appeared in 7 cases from those in the second group. The conclusion is warranted that employees whose first X-ray showed a negative chest were not, during the decade, more likely to develop a clinically significant pulmonary tuberculosis than those whose first roentgenogram showed a healed primary complex. Incidence was practically the same for each sex. In the third group, those showing lesions requiring further study, various conditions were encountered. Bronchiectasis was encountered in 60 cases (2.0 per cent), diaphragmatic pleurisy in 38 cases (1.2 per cent) and fibrinous pleurisy in 19 cases (0.6 per cent). There were 18 cases (0.6 per cent) of pleurisy with effusion. Three of these later developed pulmonary tuberculosis, 2 cases within one year and one case within two years. Bronchopneumonia was encountered in 27 cases (0.8 per cent) and lobar pneumonia was infrequent although it undoubtedly occurred in some cases not examined. Nontuberculous spontaneous pneumothorax was encountered in 14 cases (0.4 per cent). Eleven of this group were males and 3 were females; the ratio of males to females is about 11:1, taking into consideration the sex distribution in the whole group of 3,179 persons in this study. The collapse was on the left side in 8 cases and on the right in 6. Pulmonary tuberculosis has not developed in any of these cases. There were 25 cases (0.8 per cent) in whom no definite diagnosis could be reached. Two of these subsequently proved to be tuberculous, 10 have proved almost beyond question to be a healing primary complex, and 13 are still a puzzle. A group of 33 cases (1.0 per cent) were observed because of definite scarring of one or both apices. Five of these lesions progressed and were shown to be tuberculous, while 28 have remained stationary. Many important conditions and diseases occur in the lungs of apparently healthy working adolescents and adults which are unrecognized by the usual clinical examination. No examination of the lungs should be considered complete without a fluoroscopic or roentgenographic examination.—*Serial Chest Roentgenograms of 3179 Office Employees, 1926-1938, H. H. Fellows, J. Indust. Hyg. & Toxicol., May, 1940, 22: 157.*—(*L. F. B.*)

Roentgenograms of 640,000 Persons.—Chest X-ray films of nearly the entire population of the German *Gau Mecklenburg* were made. The pictures taken with small films (24 x 24 mm.) proved to be sufficiently exact. They were enlarged by projection. Statistics

of the discovered anomalies of the thoracic cage and its contents are reported. Tuberculosis of the lungs was found in 1.37 per cent. Relatively often there were found deformities of the vertebral column (1.72 per cent), cardiac enlargement (1.25 per cent) and enlargement of the aorta (2.87 per cent).—*Die roentgenfachärztliche Auswertung von über 640,000 Roentgenaufnahmen aus Mecklenburg, F. Berner, Ztschr. f. Tuberk., December, 1939, 83: 268.*—(*G. C. L.*)

Roentgenology in Pulmonary Tuberculosis.—The X-ray films in pulmonary tuberculosis must always be interpreted with due caution, in respect to the type of pathology present. This is especially true when therapy is being considered. Much still remains to be learned about the natural course of pulmonary tuberculosis. With the advent of collapse therapy the tendency has grown to apply this form of treatment early in the disease without a period of preliminary observation on bed-rest. There is no doubt that all types of tuberculosis, including cavitary disease, can heal spontaneously. Not infrequently the beneficial results of collapse therapy are coincidental in that spontaneous healing would have occurred. The value of collapse treatment is not underestimated but it should not be used indiscriminantly and should not be applied before a period of several weeks of careful observation. This procedure will diminish the number of unnecessary pneumothoraces. Five case histories to illustrate spontaneous healing and one to illustrate healing under pneumothorax are presented.—*Nettoyages radiologiques au cours de la tuberculose pulmonaire, L. Rousseau, Laval méd., November, 1939, 4: 360.*—(*H. R. N.*)

Roentgenography in Children.—In addition to the well known and frequent changes in the hilar regions and tuberculous infiltrations, calcified foci may be found in the upper lung fields of children. They represent healed secondary lesions, particularly so-called Simon's foci. These calcified areas are proven to be more dangerous than generally assumed. They may become starting points of an open pulmonary tuberculosis, most frequently at puberty. A report of 2 cases illustrates the possibility of such a development. It is therefore necessary to have a regular follow-up of these children. Treatment might be advisable, in spite of an otherwise asymptomatic condition, to strengthen resistance.—*Worauf kommt es bei der Röntgen—Reihenuntersuchung bei Tuberkulose im Kindesalter an?, W. Schwenk, München. med. Wchnschr., September 15, 1939, 86: 1419.*—(*A. B. T.*)

Roentgenography of Larynx.—The presence or absence of the shadow of the ventricle should be determined, then the arytenoids studied, as these move with phonation and swallowing. Finally the pharynx, pyriform sinuses, vestibule and trachea are studied, the epiglottis itself, the level of the larynx and its borders. Tumors may encroach on or distort any of these, benign tumors appearing clearcut, malignant ones hazy. Spread downward can often be visualized by this method alone. This method is of value in checking the results of therapy. In acute laryngitis and some forms of early tuberculosis the outlines of the air spaces are blurred and the ventricles obliterated. Later changes in tuberculosis are swelling of arytenoids and epiglottis. Considerable aid may be obtained by having the patient inflate his cheeks as though blowing a trumpet. A number of interesting roentgenographic reproductions are shown.—*The Radiological Examination of the Larynx, R. S. Stevenson, Tubercle, August, 1939, 20: 496.*—(*A. P.*)

Respiratory Blurring.—Roentgenograms of the thoracic and lumbar spine taken while the patient breathes normally are of great value, particularly in adequately portraying the thoracic spine in a lateral view. A complete respiratory cycle of one inhalation and one exhalation is concluded in one X-ray exposure. A similar technique is used to obtain a postero-anterior view of the sternum. For an adequate outline of the sternum the patient lies at a right angle to the table and the X-ray tube is tilted 25 degrees so that the sternum is projected into the right pulmonary field. By the use of the technique with respiratory blurring the ribs and pulmonary fields are so out of focus that they do not obscure the spine which

remains motionless during respiration. By this method the necessity for stereoscopic examination and sectional roentgenograms frequently may be eliminated.—*Respiratory Blurring in Routine Roentgenography, E. Kraft, Quart. Bull. Sea View Hosp., January, 1940, 5: 167.*—(*A. A. E.*)

Roentgen Evidence of Tuberculosis and Tuberculin.—A study of 63 children who contracted pulmonary tuberculosis while under one year of age and who were followed from the earliest evidence of a primary complex to calcification or death from tuberculosis demonstrated that 16 of these children presented roentgen evidence of pulmonary infiltration prior to the development of cutaneous sensitivity to tuberculin. These results are contrary to the general impression now held that a positive tuberculin reaction coincides with or precedes the appearance of recognizable roentgen evidence of the primary complex. The theories which may be advanced as possible explanations of these results are briefly considered.—*Sequence of Roentgen Evidence of Tuberculosis and Cutaneous Sensitivity to Tuberculin, M. I. Levine, Am. J. Dis. Child., October, 1939, 58: 799. (From the author's summary)*—(*M. B.*)

Stereoscopic Bronchography.—The importance of lipiodol in the diagnosis of respiratory diseases is well recognized. A common defect of current radiography is that the image is seen in only two dimensions resulting from the projection on the film of a body which in reality has three dimensions. Stereobronchography gives the third dimension of depth but this technique is not in current usage. Bronchoreliefography which the authors describe gives the plastic impression of depth which corresponds to the bronchial tree filled with iodized oil. The authors have used this method for five years. The principle of the method is similar to that of photography. In 1905 Poitovin reproduced the appearance of relief in photographic images of flowers, leaves, ornaments, etc. This technique now applied to bronchography is simple and economical. First, an X-ray film rich in bronchographic details is obtained. From this a positive film is made. Then, placing the two films in a cone with displacement of the negative a few millimeters horizontally and vertically, one final negative is made. This is called a dianegative. By means of a little displacement of the two images in a horizontal and vertical direction a white and black shadow is obtained giving the effect of relief in the shadows to be visualized. The best pictures are obtained with the least possible displacement. Copies of the dianegative give a remarkable effect of relief. The bronchoreliefograph gives a better tridimensional appearance than the bronchograph of current use.—*Bronchorelievographie, M. R. Castex, E. Alvarez & E. S. Mazzei, Arch. méd. chir. de l'app. respir., 1938, no. 6, 13: 441.*—(*J. E. F.*)

Roentgenkymography.—The authors employed the radiokymographic method of Stumpf in their studies on the physiology of respiration, with dogs as the experimental animal. They found this method valuable not only in the study of normal respiration but also in pathological states and in thoracic surgery. The kymographic method, by permitting the study of motility, reveals minute details of lesions of the lung, mediastinum, diaphragm and intrathoracic structures. The method permits the thoracic surgeon to follow step by step the modifications of the respiratory physiology caused by immobilization and to better evaluate one given form of collapse therapy in contrast with another.—*La roentgenkymographie dans l'étude de la cinématique respiratoire, A. Rodriques & R. Carvalho, Arch. méd. chir. de l'app. respir., 1939, no. 1, 14: 24.*—(*J. E. F.*)

Roentgenkymography. — Roentgenkymography and cinematography have been used to study the motion of an organ during different functional phases. Cignolini has devised an apparatus that makes possible a fine analysis of the changes in shape, size, density and relation of the individual components of the structure of heart and lungs during such functional phases. The lungs in normal respiration and during a coughing spell, and the changes of the pulmonary pattern in relation to the cardiac rhythm may thus be studied. The regmo-

graphic apparatus can be set up by simple and economical additions to the radiological department of any hospital. The apparatus is described in detail. With this apparatus one does not obtain a cinematographic reproduction of the function of the organs, because, as a rule, only four frames of a film roll are exposed per minute. These exposures are made at 1/1000 of a second. Every exposure sensitizes one frame of the ratiographic film roll, which moves very slowly. The haziness caused by the motion is negligible. In the interval of time between exposures the film roll travels far enough to put into place an unexposed frame. Frames can be made to be from 7 to 30 cm., either in width or in height. With this same apparatus it is also possible to take normal size roentgenograms at the same high speed of 1/1000 of a second, at a focal distance of over 160 cm.—*Nuove applicazioni della Roentgen-cinematografia alla diagnostica dell'apparato respiratorio. La Regmografia di Cignolini, L. Pigorini, Ann. d. Ist. Carlo Forlanini, November–December, 1939, 3: 913.*—(*S. L.*)

Tomography.—Localization of cavities is most important when the use of Monaldi's operation is under consideration. Radiography may be sufficient, in different projections, when cavities are located in the lower $\frac{2}{3}$ of the lung. In as much as most cavities are in the upper $\frac{1}{3}$ of the lung, stratigraphy is the only method that will overcome the confusing shadows given by the soft and hard tissues in the common roentgenogram. Stratigraphy with a planigraph at a focal distance of 150 cm. has many advantages. The exact localization and morphology of the cavity can thus be obtained; its depth in the lung and the best approach for the introduction of the trocar. After the sound is in place, it is necessary that it be in the cavity in such manner that aspiration can be made with success. If the cavity is large, at first even fluoroscopy can give the necessary control of the sound; but at a later date, when the lumen of the cavity has much decreased, only a stratigraphic examination will give with certainty the relation between the tip of the sound and the residual cavity space. By stratigraphy a study can be made of the mode of cavity closure, whether concentrically, or by cohesion or retraction. This is, however, more of scientific than practical interest. By stratigraphy we can better judge when the cavity space is completely obliterated so that the sound may be withdrawn. After the sound has been withdrawn and during the period of postoperative observation, stratigraphy will show to a greater degree of certainty whether or not the cavity stays closed. Seven cases, representative of 40 patients treated by the Monaldi method, are discussed and their stratigraphic films are presented to better evaluate the different points of the argument.—*L'impiego della stratigrafia nell'aspirazione endocavitaria, G. Torelli, Ann. d. Ist. Carlo Forlanini, January–February, 1940, 4: 61.*—(*S. L.*)

Tomography.—There are four fundamental methods for obtaining a selected layer on a roentgenogram with disappearance or blurring of superimposed shadows: (1) Simple motion of the lower jaw so that the underlying motionless cervical spine will not be obscured; (2) respiratory motion of the viscera so that the thoracic spine and sternum may be freed from superimposed pulmonary densities and the lumbar spine from intestinal and diaphragmatic patterns; (3) rotating motion of the body about an axis while the X-ray tube and film remain motionless during exposure; (4) synchronized simultaneous motion of the X-ray tube and film in opposite directions while the object remains fixed during the exposure. This last method is the one used in layer techniques. Parallel flat levels may be obtained by arc motion, circular, spiral and sinusoidal motion, or by linear motion. Linear motion obtained by a pulley system has been successfully used in the Sea View Hospital. The system is inexpensive and easily installed on the ordinary Bucky table. For small areas the approximate location of the lesion is determined by lateral, oblique or stereoscopic roentgenograms and then levels about one-half inch apart are recorded at the suspected site of the lesion. For a general survey of the lungs levels are routinely taken at two, three and four inches anteriorly as well as posteriorly. A lead grid, either stationary or

movable, is always necessary. The technique requires close supervision and integrated teamwork. In the diagnosis of pulmonary cavities routine use of the layer technique is not advisable because it is expensive and time-consuming and in the majority of cases cavities can be recognized by ordinary methods. The layer technique is definitely indicated when cavities are suspected but cannot be distinctly recognized because of their location or because of superimposed densities, or when the sputum is positive for acid-fast bacilli but cavities cannot readily be demonstrated. Information should first be obtained from routine and Bucky films. Layer and Bucky films were most helpful in pneumothorax cases since, in these, the two techniques were helpful in 87.5 per cent of cases. In postthoracoplasty cases layer and Bucky films were helpful in 85 per cent. However, Bucky films had disclosed 64 per cent of the unrecognized cavities while layer films accounted for the remaining 36 per cent. In pulmonary tuberculosis without pulmonary collapse, layer and Bucky films were helpful in 76 per cent of cases, with the layer films disclosing 60 per cent of previously unrecognized cavities. Layer films taken routinely prior to major operations for unilateral disease show that the apparently normal contralateral lung contains an unsuspected cavity in 20 per cent of the cases.—*Tomographic Diagnosis of Pulmonary Cavities, E. Kraft & M. Herman, Quart. Bull. Sea View Hosp., April, 1940, 5: 279.—(A. A. E.)*

Tomography.—With the aid of tomography tuberculous cavities can be found which are not to be seen on the ordinary X-ray picture. It is necessary to take pictures at a good number of levels, beginning near the dorsal wall of the thorax.—*Zur Tomographie tuberkulöser Kavernen, A. Schuberth, Ztschr. f. Tuberk., October, 1939, 83: 207.—(G. C. L.)*

Litten's Phenomenon.—This phenomenon is not constant. When seen, it is an index of good mobility of the diaphragm and of retained elasticity and mobility of the lower pulmonary margin. Its absence, in itself, may only be considered as suspicious, while its disappearance represents a definite sign of modified relations. This phenomenon disappears, often only transitorily, in pathological processes that alter the normal elasticity of inferior thoracopulmonary regions, or in total pneumothoraces and in exudative pleurisies, if there remain no definite changes. It may decrease proportionally to the residual plastic-adhesive conditions, or it may definitely disappear if these conditions are extensive. In selective apical pneumothoraces the phenomenon may persist, normal or with decreased intensity, but will disappear when effusions occur, just as it will disappear following phrenicoexairesis and total thoracoplasty. The persistence of Litten's phenomenon is not a definite sign of a free pleura. Fluoroscopic findings have generally confirmed the aforesaid observations, on the basis of which it may be concluded that if the presence of this phaenomenon indicates persistence of diaphragmatic mobility, its disappearance may be a safe indication of modified anatomo-functional relations. This obviously confirms the necessity of fluoroscopic examination of diaphragmatic motion, because orthodiascopy of the diaphragm is today universally recognized as the method of choice for careful study of diaphragmatic excursions.—*Il fenomeno diaframmatico di Litten al controllo radioscopico, F. Cafiero, Arch. di med. e chir., December, 1939, 8: 811.—(S. L.)*

Angiography.—The conventional roentgenogram of patients with massive pulmonary fibrosis, or fibrothorax, fails to reveal the essential features of the cardiovascular system. Visualization of these structures is now possible by means of injecting contrast media into the right cephalic vein and obtaining X-ray films of the chest at various intervals after the injection. By using a rapid stereoscopic cassette shifter, two exposures can be made with each injection and thus both sides of the heart and large vessels can be visualized. Both anteroposterior and oblique films are made. A case of right-sided fibrothorax is presented in which the usual methods of study, including roentgenkymography, planigraphy and bronchoscopy were shown to be inadequate. By means of contrast roentgenography, it was found possible to identify the size, shape and

location of the superior vena cava, the cavities of the heart, the pulmonary circulation and the thoracic aorta.—*A Visualization Study of Fibrothorax: Identification of the Cardiovascular Structures, J. Steinberg & G. P. Robb, Radiology, September, 1939, 33: 291.*—(*G. F. M.*)

Azygos Vein.—The standard posteroanterior X-ray film of the chest of a woman disclosed an annular shadow above the right clavicle, which was at first interpreted as a tuberculous cavity. Physical findings, however, did not confirm this diagnosis. Exhaustive laboratory studies had also failed to reveal tubercle bacilli. Further anterior and posterior oblique projections were made, and these clearly demonstrated an anomalous azygos vein with the complementary accessory lobe, and no visualization of the presumed cavity seen in the posteroanterior film. This case report tends to prove that the simple X-ray film in the posteroanterior position, with the ordinary technique, may at times lead to wrong diagnostic conclusions regarding the stage and entity of a tuberculous process. By further X-ray studies, in various projections, a long and unnecessary course of collapse therapy may be spared the patient.—*Immagine anulare dell'apice destro (pseudocaverna) prodotta dal decorso anomale della grande vena azygos, M. Valli, Riv. di pat. e clin. d. tuberc., August, 1939, 13: 613.*—(*S. L.*)

Pleural Pain.—Relief of pain is urgent when it interferes with a vital function such as respiration. It has been found possible to relieve severe pleural pain by the injection of novocaine into the pleura. This has been done by superficial and deep injection of 5 to 10 cc. of 2 per cent novocaine in one or more interspaces in the region of maximum pain. Piercing the parietal pleura and presumably entering the pleural cavity seemed to give the best results. Thirty-one patients suffering severe pleural pain in the course of pneumococcus pneumonia were treated in this manner. In 25 there was immediate and complete relief, while 6 experienced residual soreness. In the former group 18 had no recurrence of pain, while in the others it returned after intervals of five minutes to twenty-six hours. However, the pain could subsequently be more readily controlled with narcotics. In one case of pulmonary infarction with severe pain injection of novocaine gave complete relief for twelve hours. After relief of pain by this method there was noticeable improvement in the ease of respiration. Similarly, coughing ceased to be distressing and consequently patients raised sputum more readily. It is felt that some of the relief was due to local accumulation of fluid between the pleural layers at the site of injection. No harmful effects could be noted.—*Deep Injection of Novocaine for the Relief of Pleural Pain, S. Schnur, Ann. Int. Med., November, 1939, 13: 845.*—(*A. A. E.*)

Prontosil in Pyopneumothorax.—Two cases of malignant pyopneumothorax, developing in patients with tuberculosis during the administration of pneumothorax treatment, were carried to complete recovery by the use of prontosil intrapleurally, as well as intramuscularly, and in conjunction with repeated aspiration of the pleural fluid. In both patients the complication came on in the sudden and violent manner characteristic of this type of pleural infection; chills, fever of 103 to 104°F., severe chest pain, dyspnoea and vomiting. To relieve the emergency present aspiration was at once and repeatedly resorted to, with the usual very temporary relief. Employment of the various dyes and antiseptics, including oleothorax, was, in the light of past experience considered the loss of important time, but a trial was made of dettol, a saponified xylenol derivative recommended by Gilmour, with no noticeable effect. The condition of both patients becoming steadily worse the use of prontosil was determined upon, though the pleural fluid showed no bacteria on direct smear nor did its culture give any growth on blood agar. Intrapleurally, 5 or 10 cc. of the prontosil was instilled after each aspiration of fluid; done at intervals of three to seven days. Intramuscularly, 5 cc. of the dye was injected into the buttocks every one to three days. Improvement was noted after the first injections and was steadily and consistently maintained. The temperature became normal in

twenty-two and thirty-five days respectively, while total and permanent absence of the pleural fluid was shown by radiographic examination after fifty and fifty-seven days. The total amounts of fluid aspirated were 3725 and 5469 cc., in 12 and 17 operations. There was a short rise of temperature some hours after the intrapleural injections, but no other reactions to the dye were seen. Bronchopleural or chest-wall fistulae threatened at no time. Pleural adhesion, resulting from the fluid presence, reduced the lung collapse in one case from 80 to 25 per cent, in the other from 70 to 30 per cent. Both patients became symptom free, having no fever, cough, expectoration, pain or dyspnoea. Strength and weight returned to their normal and the patients have fully resumed their former vocations, at which they have continued without relapse for the two years since recovery. It is assumed, by virtue of experience, that the treatment described obviated the probable necessity of a thoracoplastic operation. Further, stopping the long-continued exposure of the pleura to a highly infectious fluid prevented the development of amyloid disease, other complications, and the entrance of the patient into a cachectic state to which there would have been but one ending.—*Prontosil in Pyopneumothorax, L. Schlenker, Illinois M. J., June, 1939, 75: 555.*—(*L. S.*)

Sulfanilamide.—The chemotherapeutic effects of sulfanilamide in tuberculosis have been evaluated to some extent in experimental animals but the results have been controversial. Thirty-five patients, 20 males and 15 females, with pulmonary tuberculosis of moderately or far advanced types were treated with sulfanilamide over a period of from ten to fifteen weeks. The drug was given by mouth in 10 grain doses three times daily, with equivalent amounts of sodium bicarbonate, and the dosage was gradually increased until at the end of a month each patient was receiving 20 grains three times a day. None of these patients received any form of collapse therapy and all were either semiambulant or confined to bed. No physical or subjective improvement could be noted in any patient. However, toxic symptoms were numerous. Nine patients had severe and continued headaches after three weeks and discontinuance of sulfanilamide caused the headaches to disappear, but they recurred when the drug was readministered. Cyanosis was common but of no great significance. Severe anaemias and granulocytopenia were not demonstrated, although 20 patients were anaemic before sulfanilamide was given. It is felt that these rather disappointing results were to be expected since in tuberculosis the bacilli are isolated in relatively avascular lesions which are walled off by fibroblasts and epithelioid cells. This fibrous tissue provides a barrier to the intercellular fluid in which the sulfanilamide might be transported to the tubercle bacilli. In none of the patients in this series was positive sputum rendered negative.—*The Use of Sulfanilamide in Pulmonary Tuberculosis; Preliminary Report, E. B. Freilich, G. C. Coe & N. A. Wien, Ann. Int. Med., December, 1939, 13: 1042.*—(*A. A. E.*)

Gold Therapy in Pulmonary Tuberculosis.—Out of 150 papers published on the treatment of pulmonary tuberculosis with Sanocrysin, 140 are discussed in this publication. Most of them are considered to be methodologically insufficient and only eight are rated valid. The paper by Amberson, McMahon and Pinner is authoritative; these authors made all their patients believe that they received Sanocrysin, although one half of the group received injections of distilled water. The authors of these eight papers uniformly come to the conclusion that Sanocrysin has no therapeutic effect, whereas most of the other authors report good results. Eighty-four of the publications mention toxic effects, most frequently renal damage. There is no relation between dosage and therapeutic results.—*Bilanz der Goldtherapie bei der Lungentuberkulose, II. Sanocrysin, P. Martini & A. Rosendahl, Ztschr. f. Tuberk., May, 1940, 84: 330.*—(*G. C. L.*)

Gold Therapy.—Thirty patients with pulmonary tuberculosis were treated with *Solganal-B oleosum.* Cavity healing was observed in 3 patients within three to six months. Small doses, beginning with 2.0 mg. and increasing gradually to 10.0 mg., were given every

five days or twice a week. The total amount used in each case was 2.5 to 3.0 g. *Solganal-B oleosum* was selected because of its low toxicity and because, as an oily suspension, it is slowly absorbed. The only toxic manifestation of the gold used in this series was a dermatitis which occurred in one patient and which disappeared when the gold was withdrawn.—*Zur Frage der Kavernenheilung nach Goldbehandlung, G. Petassis, Ztschr. f. Tuberk., May, 1939, 82: 291.*—(*A. B. C.*)

Copper in Tuberculosis Therapy.—A new copper preparation, Cuprion, the sodium salt of a copper-thiourea-compound, was tested in rabbits. Its intravenous administration causes no renal damage. It is stored in liver and spleen and is very slowly excreted through the intestines. One hundred and seventeen patients with pulmonary tuberculosis, in whom no other active therapy was possible, were treated with intravenous injections of Cuprion. Out of 104 patients with positive sputum 51 per cent turned negative. The erythrocyte sedimentation rate decreased in 39 per cent of 93 patients, in whom it had been increased. Sometimes albumin, leucocytes and erythrocytes appeared in the urine, but no permanent damage was observed. Most of the patients showed an increase in weight. It is believed that the indication for this copper preparation is the same as that for gold.—*Das Kupfer in der Behandlung der Lungentuberkulose, G. Goralewski, Ztschr. f. Tuberk., May, 1940, 84: 313.*—(*G. C. L.*)

Cadmium Sulphide in Treatment of Pulmonary Tuberculosis.—Recently, Heaf has concluded that cadmium, in the form of sulphide or glycine, was harmless and its beneficial results comparable to those of gold salts. He used a 1 per cent emulsion of cadmium sulphide in sterile olive oil intramuscularly, found it painless, nontoxic and appearing to stimulate fibrosis and inhibit tubercle formation. Its cost is considerably less than that of gold. Robertson had planned a direct comparison of groups treated by cadmium with those treated by the gold salts. His maximum dose, 6 to 7 cc. was larger than that of Heaf, who used 3 cc. The total volume given was 35 to 41 cc. He selected the patients in a block of 40 beds who ordinarily would have received sanocrysin. The results are those of a preliminary review after three months. Of 20 cases reviewed, 16 received the therapy because of contralateral lesions appearing in the course of pneumothorax therapy, a type of lesion most suitable for gold treatment. Only one of the 16 showed roentgenographic clearing, 8 no improvement and 7 definite progression. One of these later improved markedly under sanocrysin. Analysis of supplementary findings was equally discouraging. Hence, cadmium was abandoned. Although of low toxicity, its value is regarded as doubtful and its harmlessness not above suspicion.—*Cadmium Sulphide in the Treatment of Pulmonary Tuberculosis, J. S. Robertson, Tubercle, March, 1939, 20: 275.*—(*A. P.*)

Results of Treatment of Tuberculosis by Endotoxoid and "Specific" Serum.—"Anti-tuberculosis Endotoxoid" consists of antigenic principles liberated by "smooth" strains of the tubercle bacillus (human, bovine and BCG) when concentrated suspensions are first heated to 60°C. for thirty minutes, then submitted to repeated exposures at −30°C. The product is then centrifuged at high speed and the final solution has high antigenic properties *in vivo* and *in vitro*, some precipitating flocculating properties, and the power of complement fixation with "specific serum" in dilutions up to 1 to 5000 in sensitized persons or animals. This report deals with 242 cases of human tuberculosis treated either with this product alone or combined with "specific serum." They were carried out in patients in various hospitals of the Union of South Africa; 144 were Europeans, 98 African natives or mixed types. The period was 1935 to 1938. All but a few were bacteriologically positive and these others confirmed by X-ray films and tuberculin tests. Most of the pulmonary cases were rather advanced and progressive and had not responded to chrysotherapy and pneumothorax. At first a combined serum treatment followed by endotoxoid was used but some unpleasant reactions to the serum were experienced and later endotoxoid was used alone. Reactions are usually absent

or mild. A few develop oedematous or erythematous local patches with slight rise of temperature the evening of the day of injection. The initial dose in the first series was 0.1 cc. with increasing doses at weekly intervals up to 1.5 cc., the entire course consuming three to six months. Since 1937 it has been given twice a week up to 0.5 cc. and beginning with 0.05 cc. Beneficial effects are usually observed after a few weeks but especially during the second and third months. Increase of weight and sense of well-being, lessened cough and sputum, disappearance of bacilli from sputum and stabilization of the lesions are among the beneficial effects to be anticipated. Clearing and cicatrization of lesions appear to be unusually rapid. Reports from each institution are given with details and roentgenographic illustrations. Tuberculous endotoxoid is innocuous and may be injected in all forms of tuberculosis in considerable doses over long periods without serious reactions. Its therapeutic action is definite in man, especially in early and moderately advanced lesions. Of the 136 Europeans, 63 per cent benefited in varying degree. Of 84 natives, 37 per cent benefited.—*The Treatment of Tuberculosis by Means of Antituberculosis Endotoxoid and Specific Serum, E. Grasset, Tubercle, June, 1939, 20: 397.*—(*A. P.*)

Tuberculosis Settlements and Rehabilitation.—Analysis of the figures from Barrowmore Tuberculosis Sanatorium and Settlement (in Northwest England) indicates that too far advanced cases are being sent for treatment precluding any question of reëmployment and that the average time before the question of settlement is considered is too long. A breakdown after one period of sanatorium treatment should be sufficient reason to strongly consider settlement. Heaf has already concluded (1939) that our present tuberculosis schemes do not afford sufficient opportunity to resume normal life or be reabsorbed into industry. A National Board of Control for the rehabilitation of the tuberculous is needed, formed on a voluntary basis but subsidized by State contributions. Money now spent on fruitless treatment should be used for subsidizing industrial concerns for employment or for segregation. A much broader view should be taken of the patient's economic difficulties. Sandiland would emphasize the necessity for adequate medical control, as the absorption of the chronic ambulant case, frequently sputum-positive, is not without danger to others and too hastily conceived local settlement schemes are likely to fail because of financial difficulties and lack of suitable applicants. The ideal settlement should have a sanatorium section, an industries section and the settlement proper. McDougall, at Preston Hall, Kent, with an average of 260 patients constantly under treatment and not less than 150 village settlers, found the cost per person per week over seven years to be less than two-thirds the average cost of sanatorium treatment in institutions locally administered. At Barrowmore Hall, for the two years ending March 31, 1932, the average cost per patient worked out to about $18 per week from which should be deducted an average of $166.86 per man per year or over $3.00 per week paid out in wages. Capital expenditure, a primary obstacle, should be provided from State funds. Later losses will depend on the policies of the board of management. The running of the industries department should be under the control of a well paid and skilled manager with skilled working foremen in charge of each department who should be fairly "fit" tuberculous subjects. Increased turnover in the industries should be obtained through the sales department by expansion of trade of a personal character and by launching out into contract work. Floating capital is needed for machinery and advertising. Machinery should not be allowed to stand idle if this can be avoided. Local authorities and public bodies, especially education authorities, can be of much assistance in placing contract work. The securing of suitable settlers means painstakingly placing before the tuberculous the facts and probabilities as to their economic future. Doles under the guise of employment are apt to be rejected, especially if the undertaking is of dubious financial stability. Settlements ought to form one of the chief methods of attacking the tuberculosis problem and should be run without excessive expense if there is intelligent coöperation from local authorities.—*Impressions after Sixteen Years' Experience*

in a Tuberculosis Settlement, E. L. Sandiland, Tubercle, January, 1940, 21: 121.—(A. P.)

Rehabilitation of the Tuberculous.—Post-sanatorium assistance for the control and training of the healed tuberculous is primarily a clinical problem. All attempts at rehabilitation based on empirical criteria have failed. To succeed in a good program of after-care it is necessary to investigate the various functions of the human organism, to check on their limitations, meanwhile clarifying the reciprocal correlation of the different physical systems. When deficiencies are discovered they should be corrected and brought within normal limits by means of regulated activities. Only when the individual has been controlled from the biological standpoint, may the social problem, secondary in importance, be approached. This problem must be based upon thorough knowledge of the biological resources of the individual, who after months or years of sanatorium care has regained a certain degree of physical well-being. His recovered energy must be utilized only within the limits that clinical observation had already determined. The physiopathology of healing in the field of tuberculosis, especially of the lung, has not been sufficiently explored. Many functional problems have not yet even been studied, others have been only superficially approached. This is a fertile field for future research; meanwhile it is extremely useful, one might say practically indispensable, to study those indices that have probable value in judging the working capacity of a healed tuberculous patient. This active after-sanatorium program does not exclude the possibility of also creating in the sanatorium a program of adequate work for the patient under treatment, which has already proved beneficial to body and mind. This work therapy in a sanatorium is a help to the healing process; a program of after-care is the final phase of assistance to the tuberculous, who, having obtained healing, must attempt to use the maximum of his working capacity in order to be accepted again in the ranks of those living a normal life.—*Il controllo e la rieducazione dei tubercolosi guariti, G. Costantini & E. Lenci, Riv. di pat. e clin. d. tuberc., November 30, 1939, 13: 769.—(S. L.)*

Progression of Tuberculosis during Pneumothorax.—From the study of about 400 cases it was noted that spread frequently occurs soon after the induction of pneumothorax, rarely late in the course of treatment. This fact is evidently due to new mechanical conditions created by the pneumothorax and to immunobiological characteristics of the organism. When collapse treatment has been able to exert its action on the lung and on defensive powers of the organism, and the disease shows a decided tendency towards healing, progressive tuberculous processes rarely occur. The effectiveness of a pneumothorax is an important factor in relation to the possibilities of relapse or spread in a collapsed lung. Progression often occurs in an ineffective pneumothorax, when adhesions or extensive lesions are present; when the pneumothorax is kept of good volume and the lung is well collapsed and atelectatic, spread is much less common because of the limited pulmonary function and of the defensive anatomical conditions, such as bronchiolar occlusion and fibrotic changes in the parenchyma. Quite often contralateral spread has been associated with spread in the collapsed lung; it is not always possible to determine in what lung this progression occurs primarily. Spread occurring during pneumothorax was frequently noted around preëxisting lesions. This would explain progression as being more a phenomenon of reactivation than one of new implantation of the disease. Early spread in a collapsed lung may be attributed to shock and intrapulmonary diffusion by the mere act of squeezing and dislocating the initial lesions. Most often spread seems to occur through the lymphatic route, but may also be produced through the haematogenous or the bronchogenic routes. Progression of cavernous lesions is commonly due to inefficient collapse, especially because of tense adhesions. The cavities, however, often show an apparent progression, frequently reversible, with marked changes in size because of frequent occlusion of the draining bronchus.—*Sui processi di evoluzione della tubercolosi del polmone trattato*

col pneumotorace, E. Lenci, Riv. di pat. e clin. d. tuberc., April, 1940, 14: 243.—(S. L.)

Contralateral Pneumothorax.—In a man of twenty-eight with bilateral tuberculosis and left-sided pneumothorax, following the abandonment of the pneumothorax, a cavity appeared on the right side. When the pneumothorax was reinduced on the left side, the cavity on the right side disappeared.—*Beeinflussung einer tuberkulösen Kaverne durch kontra-lateralen Pneumothorax, A. Beekmann, Ztschr. f. Tuberk., October, 1939, 83: 137.—(G. C. L.)*

Cessation of Pneumothorax.—A large number of cases develop active disease within two years of reëxpansion of the lung. In reviewing the cases, prognosis depended more on whether the collapse attained was satisfactory than on any other factor. Opinions as to the correct time to terminate a pneumothorax vary widely, but one should aim at getting return of function of the lung in as many cases as possible, when compatible with safety. Calculations should be based from the date when sufficient collapse was attained and not from the date of original induction. With proper collapse a minimum period of three years is advised, except with minimal disease when two years is probably sufficient. With extensive disease occupying one-third or more of the lung, sufficient collapse for four years is advised. Cavitation with proper collapse requires four years and the same period applies to insufficient collapse without cavitation. With a persistent cavity, pneumothorax should be maintained indefinitely. In cases presenting pyrexial reactions following each refill, pneumothorax should be abandoned and other means of collapse used. In tuberculous empyema, the lung should be reëxpanded as far as possible preliminary to thoracoplasty. In cases where thoracoplasty has been decided upon, it is felt that the operation should be performed in the presence of the pneumothorax, if possible. The occurrence of fluid, spread of disease to the contralateral lung, or pregnancy are not indications to abandon pneumothorax.—*The Termination of Artificial Pneumothoraces, J. L. Livingstone, J. Roy. Inst. Pub. Health & Hyg., September, 1939, 2: 579.—(L. F. B.)*

Cessation of Pneumothorax.—After discontinuation of artificial pneumothorax gaseous reabsorption by the pleura continues, the pressure approaches negative, and a mechanical problem is created. The lung is obliged to expand, gradually occupying more volume. When the pleura is healthy the pulmonary expansion is easier, but retraction of the hemithorax and deviation of the mediastinum may occur. When the pleura is much thickened the gaseous absorption is slow, and pulmonary recovery not possible; the hemithorax remains contracted with an air cavity, the mediastinum is deviated and the diaphragm elevated and without motion, and displacements of the trachea and oesophagus occur, with cardiocirculatory or gastric disturbance. During the reëxpansion period dyspnoea, tachycardia and palpitation may occur. If the mediastinum is weak, reëxpansion may lead to herniation from the change of the tension in the thoracic cavity. This herniation was observed in 2 patients. Effusions in the pleural cavity during reëxpansion are serofibrinous, haematic or purulent. This was observed in 3 patients. Bronchiectasis is sometimes observed. For prophylactic measures the authors advise the gradual accommodation of the lung to the air chamber, with less air on each injection. Radiological supervision is necessary. In treatment, oleothorax and phrenic nerve operation are to be considered. All the disturbances of the discontinuation of artificial pneumothorax correspond to the mechanical pathology of the thorax and demand a rigorous control of the patient during that period.—*La suspension del neumotorax artificial, Patologia de la reexpansion pulmonar, J. B. Ferradás, Publicaciones del Centro de Investigaciones Tisiologicas, 1939, 3: 105.—(E. C. I.)*

Relapse following Pneumothorax.—The late results of incomplete pneumothorax are far from ideal as is shown by various stastistics from the literature. Five cases are described which demonstrate how adhesions which allowed an effective although incomplete collapse may interfere with definite healing. In these

cases a cavity is transformed into a closed focus without real scar formation. It thus may become the origin of new spreads and exacerbations particularly at the time when the pneumothorax is reëxpanded.—*Über Rückfalle nach scheinbar erfolgreich abgeschlossener Pneumothoraxbehandlung, W. Behrens, Schweiz. med. Wchnschr., March 18, 1939, 69: 233.*—(*A. B. T.*)

Relapse following Pneumothorax.—This investigation, carried out at Oresund Hospital, Copenhagen, Denmark, comprises all the cases of pulmonary tuberculosis with cavitation which, having had artificial pneumothorax treatment instituted between January, 1927 and June, 1932, were classified as inactive for at least one year, regardless of whether pneumothorax treatment had been discontinued, (excluding a few cases because of insufficient observation). The term "inactive" here means abacillary, without demonstrable cavitation clinically or roentgenographically and without other evidence of activity. The sedimentation rate was ignored because it often remains elevated for years in spite of effective pneumothorax or after its cessation. There were 106 such patients. In 21 (20 per cent) reactivation of the lesion was demonstrated during the observation period. Of these, 16 developed fresh contralateral lesions, 4 having previously had older foci in this lung. One patient developed a fresh spread of reactivation of the process in the previously collapsed lung four years after cessation of treatment. One patient developed evidence of acute pneumonia while under treatment. Two patients became positive after cessation of treatment, one dying a little over a year later without roentgenographic examination, the other dying following haemoptysis a little after two years with unchanged roentgenographic film characterized by opacity and retraction. One patient developed a peptic ulcer with melaena under treatment and died of pneumonia a month after gastric resection. In 9 additional patients (8.5 per cent) tubercle bacilli were demonstrated temporarily while under observation, either in the sputum or gastric contents, without other evidence of activity and later became again sputum-negative. Five of these showed only a single positive finding, on direct smear, thereafter being negative by cultural methods in three instances; in one case pneumothorax was reinstituted and in another an almost obliterated space was reëstablished. The other 4 cases were positive by cultural methods only, 2 from the sputum and 2 from the gastric contents. Three of these reverted to negative on routine reëxaminations, the fourth after pneumonolysis. These 9 cases must be placed in a category separate from both the active and inactive groups. The remaining 76 patients (about 72 per cent) remained inactive throughout the entire observation period. The greatest number of relapses occurred within the first three years, most during the first year, and of 72 remaining inactive for four years, only one subsequently showed a spread of the lesion. As all but one occurred in patients still receiving pneumothorax, its early discontinuance cannot be blamed for the greater frequency of relapse during the first year. The observation covered 81 patients followed for at least one year after cessation of clinically effective pneumothorax. Subsequent spread of the lesions was determined in 3 (4 per cent) and transitory positive sputum without spread in 4 additional cases. Both the bilateral and the more chronic cases showed greater frequency of extension. Of 6 showing extension only one was considered inactive when pneumothorax was discontinued. Veran's older cases of longer duration showed relapse in over 30 per cent, his more recent ones, with symptoms less than six months, only 4 per cent, those between six and twelve months 9 per cent. There was a much larger percentage of recent cases in Cold's series, the latter subdividing his recent unilateral cases into a group adhesion-free or limited to the mediastinum and cupola and a group with more extensive adhesions. Among 33 in the first group there occurred 21 per cent extensions, among 50 in the latter 16 per cent extensions. This leads Cold to conclude that severing of adhesions is not indicated in recent pneumothorax cases if sputum-negative and inactive for at least a year. He also mentions that many patients discharged as abacillary from the Oresund Hospital were found by Hjaltested and Terning (1939) to relapse within one year. In contrast to Veran's conclusions

Cold arrives at the negative one that in fairly recent cases there is no evidence to show that maintaining the pneumothorax beyond one to two years lowers the risk of relapse. He furthermore concludes that after three or four years of inactivity the risk of relapse is not greater than the proportion of active tuberculosis found in normal persons of similar age groups.—*On the Frequency of Relapse after Pneumothorax Therapy in Pulmonary Tuberculosis with Cavity Formation, S. Cold, Tubercle, April, 1939, 20: 301.—(A. P.)*

Pneumothorax.—It is a problem to determine to what extent collapse therapy should be applied to patients admitted to the hospital primarily for purposes of isolation. The authors attempt to determine the indications and limitations of collapse therapy for such patients. In a series of 504 patients discharged consecutively from one of the services of the Philadelphia General Hospital during the period 1935 to 1937 pulmonary tuberculosis was diagnosed in 441, or 87.7 per cent. Artificial pneumothorax was attempted in 137 instances, and was established in 27 per cent of the cases of pulmonary tuberculosis. The great majority of patients, 352, or 79.9 per cent, had far advanced lesions. Tubercle bacilli were found in 85.4 per cent of the total group and in 88.3 per cent of the pneumothorax group. The high proportion of sputum-positive patients emphasizes the importance of a city hospital in protecting the community by segregation of patients. Refusal of patients to remain in the hospital constitutes one of the greatest difficulties both in the treatment of the individual case and in the protection of the community. A majority of patients remained in the hospital less than ten weeks, 87 per cent remained less than seven months and only 6 per cent remained more than one year. Excluding those who died, 65 per cent of the colored and 40 per cent of the white patients left the hospital against advice. There were 77 patients with induced pneumothorax who were under observation for more than ten weeks. Approximately 1 in 5 of all patients on whom pneumothorax was attempted obtained a satisfactory collapse, improvement occurring in 87 per cent of this small group. On the other hand, only 29 per cent of those with a fair space and 23 per cent of those with a poor space were improved. Since the number of patients with advanced disease for whom pneumothorax treatment is successful is relatively small, and since approximately two-thirds of these remain sputum-positive, pneumothorax treatment is not a major function of the municipal hospital as far as the protection of the community is concerned. Pneumothorax should not be attempted in advanced disease when the sole reason is that the prognosis is otherwise hopeless. Pneumothorax treatment should be attempted in every case offering a chance of improvement, but if a satisfactory space cannot be obtained, prompt discontinuation is usually advisable. Provided isolation is maintained, strict bed-rest need not be enforced in cases of progressive disease in which the prognosis is hopeless.—*Problems in the Treatment of Advanced Tuberculosis in a Municipal Hospital: Based on an Analysis of the Course of Disease and Results of Pneumothorax Treatment, H. Epstein & H. W. Hetherington, J. A. M. A., March 2, 1940, 114: 723.—(G. L. L.)*

Altitude and Pneumothorax.—An important factor which may upset the equilibrium of a perfect pneumothorax collapse is the change in atmospheric pressure resulting from decided changes in altitude when traveling. In pneumothorax the air within the pleural cavity is subject to the physical laws of the expansion of gas. A knowledge of the application of these laws in individual cases may be valuable in determining the size of injection when changes of altitude are contemplated. If considerable time has elapsed since a fresh supply of air was introduced and the body has absorbed considerable air from the pleural cavity, one can endure several thousand additional feet of altitude without difficulty. The author presents a rather complicated but apparently accurate formula, which is not a constant but varies for each individual, from which a chart indicating safe altitudes can be determined for each case. The method is based on the measurement of the six foot roentgenogram of the chest combined with known data of altitude, present and contemplated, and the size of the

pneumothorax injection.—*Altitude and Artificial Pneumothorax, C. H. Gellenthien, J. A. M. A., March 2, 1940, 114: 727.*—(*G. L. L.*)

Air Embolism in Pneumothorax.—A case is described of sudden death during a pneumothorax treatment in a twenty year old woman with advanced bilateral pulmonary tuberculosis and bilateral artificial pneumothorax. Necropsy disclosed gas bubbles in the basilar artery and the meningeal and cortical blood vessels, which were believed to be the result of air embolism occurring during the insufflation of air. The accident was attributed to the accidental entrance of the pneumothorax needle in new blood vessels of a much thickened pleura.—*Accidente de embolia gaseosa seguido de muerte súbita en el curso de pneumotórax artificial, sesión de necropsia, J. Martos, Rev. Mexicana de Tuberc., November–December, 1939, 1: 141.*—(*E. R. L.*)

Ineffective Pneumothorax.—These observations were made at the Tuberculosis Department of the National Insurance Institute of Hungary, at Pestzenterzsebet, near Budapest, where patients from practically every hospital and sanatorium in Hungary are sent for pneumothorax refills. Several groups of cases are described which, it is believed, tend to bring this method into disrepute. It is admitted that one cannot follow too rigid rules regarding cessation of refills yet certain facts are obvious beyond the need for further demonstration. (*1*) Basal or Cystic Pneumothorax: Where there are old fibroid changes in the uncollapsed adherent part of the lung and significant symptoms are absent, the maintenance of such a pneumothorax is needless. If unyielding cavities are present, its replacement by thoracoplasty should be considered before determination and contralateral spread occur. (*2*) Needlessly Maintained Pneumothorax: Among such are cases of predominantly fibroid disease with adherent pleura where no mechanical nor functional effect is to be expected. (*3*) Contraselective Pneumothorax: This is the type of case in which the involved cavitary portion of the lung remains uncollapsed and collapse is confined to relatively unaffected portions, with no noticeable clinical benefit or perhaps actual deterioration. It should be possible to decide in the first few weeks whether collapse will be adequate and if unsatisfactory there is no point in maintaining it. Some cases requiring very high refills might well be replaced by extrapleural pneumothorax or apicolysis. (*4*) Continued Activity in a Collapsed Lung: There are certain cases in which pneumothorax may provoke activity in the diseased lung despite a free pleural space. (*5*) Delayed Pneumothorax: This is the type of case in which induction of pneumothorax has been performed too late, after disease has spread to the other lung and progressed, usually with considerable adhesions on the side of the collapse. (*6*) Pneumothorax with Adhesions: In many or most of these division of the adhesions should be attempted or performed but there are cases in which this is impossible yet the clinical effects are satisfactory. These should not be prematurely abandoned. (*7*) Pneumothorax Complicated by Exudate: In some of these cases persistence in the pneumothorax seems to aggravate the symptoms and condition of the patient already unfavorably affected by the exudate. In other cases improvement ultimately ensues. (*8*) The "Charitable" Pneumothorax: This is the pneumothorax which is accomplishing nothing, either due to intractable and inoperable adhesions or active contralateral disease, or both. There is no clinical justification for its perpetuation which, however, some may condone in order not to remove hope from the patient.—*Unsuitable Pneumothorax Treatment, S. Puder, Tubercle, March, 1940, 21: 197.*—(*A. P.*)

Contralateral Pleurisy in Collapse Therapy.—Contralateral pleurisy is a rare complication of pneumothorax, occurring in 1 to 2 per cent of cases. It is of tuberculous character, as indicated by positive inoculation tests. Men are more commonly affected than women, and the pleurisy occurs more frequently on the left side. Thoracentesis is usually the most suitable treatment. Whether or not the fluid should be replaced by air, with consequent induction of bilateral pneumothorax, depends on the condition of the lung on that side. The authors report a number of cases.—*Pleuresías contralaterales en la colapsoterapia, J. López*

Bonilla & E. Kozameh, Arch. argent. de enferm. d. ap. respir. y tuberc., September–October, 1939, 7: 262.—(E. R. L.)

Prognostic Value of Sputum Conversion.—The results of pneumothorax therapy can be evaluated on the basis of sputum conversion. The majority of conversions occur in the first six months of treatment. Sex and the localization of the lesions are not factors in respect to conversion. A youthful patient whose sputum is not converted in the first six months has a bad prognosis. Older patients who do not achieve conversion in the first six months may still become sputum-negative after a year or more. The earlier treatment is initiated, the greater is the probability of sputum conversion. *— Valor prognostico de la conversion del esputo, R. T. Colón, Bol. Asoc. Med. Puerto Rico, July, 1940, 32: 240.—(E. R. L.)*

Extrapleural Pneumothorax.—The technique used in over 80 cases follows closely, except for minor variations, the technique worked out by Graf in 1934 and modified by Schmidt. Indications for extrapleural pneumothorax may be divided into absolute and relative. Absolute indication exists when, were the pleural leaves not adherent, intrapleural pneumothorax could be expected to effect an arrest of a tuberculous process. This includes cases with comparatively recent involvement, in which the cavity or cavities are soft-walled with no great retraction of the lobe involved nor displacement of mediastinal structures, with no marked contralateral involvement, and the patient is in good condition. Relative indications are encountered when the tuberculous process is of long standing and the cavity walls are thick and firm. In this group of cases extrapleural pneumothorax has not proved as beneficial. It is questionable whether partial thoracoplasty with apicolysis may not be the procedure of choice. When there is marked retraction of lung with fibrosis and large thick-walled cavities a limited thoracoplasty would generally be the procedure of choice, although a temporarily satisfactory extrapleural space might be established. In such cases extrapleural pneumothorax would be contraindicated unless the initial improvement following it rendered the particular case a better risk for thoracoplasty. The ultimate fate of the lung and the extrapleural space is still uncertain. Where indications were absolute eventual reëxpansion seems desirable, although this is not yet proved. In some cases the space will be lost and some will be continued indefinitely, others will have oleothorax established, and in many a local thoracoplasty will be required to obliterate the space. *—Technique of Extrapleural Pneumothorax, F. S. Dolley, J. C. Jones & Jane Skillen, J. Thoracic Surg., August, 1939, 8: 646.—(L. F. B.)*

Extrapleural Pneumothorax.—In the past two years extrapleural pneumothorax has been performed on 29 patients at the Sea View Hospital. There was a mortality of 36.25 per cent and good results were obtained in only 25 per cent of the surviving 21 patients. Subcutaneous emphysema and collection of serosanguineous fluid in the extrapleural space occurred in all patients. Severe postoperative haemorrhage occurred in one case. Three patients developed bronchopleural fistulae and 2 of these subsequently died of this complication. Three patients developed bronchopleural-cutaneous fistulae, and in 3 others tuberculous empyema of the extrapleural space occurred. Pyogenic infection of the extrapleural space occurred in only one patient. Tuberculous infection of the extrapleural space was the most common serious complication since it occurred in 11 of the 29 patients. The indications for extrapleural pneumothorax are extremely limited and the operation should probably be used only in the young as a means of avoiding the deforming scoliosis that follows thoracoplasty, and as a temporary measure in preparing a very sick patient for subsequent thoracoplasty. This operation cannot replace thoracoplasty since the results are less good, the death rate is greater and complications are more frequent.—*Extra Pleural Pneumothorax, L. R. Davidson & I. Fink, Quart. Bull. Sea View Hosp., April, 1940, 5: 267.—(A. A. E.)*

Extrapleural Pneumothorax.—A series of 100 operations in 94 patients is described. After some months the wall of the extrapleural

cavity was covered by epithelial cells. The extrapleural pneumothorax could generally be maintained for any length of time. Spontaneous effusions were infrequent. Infections of the space were observed especially in exudative processes, perhaps due to oleothorax, which therefore should be avoided. Refills were made through the anterior chest wall.—*Erfahrungen mit dem extrapleuralen Pneumothorax, A. Brunner, Ztschr. f. Tuberk., October, 1939, 83: 170.*—(*G. C. L.*)

Extrapleural Pneumothorax.—The operation calls for subperiosteal resection of the 4th and 5th ribs for a length of 7 to 10 cm. Bloody fluid must be aspirated and replaced by air from the pneumothorax apparatus. Benign complications are subcutaneous emphysema, infection and hernia. A more severe complication is deviation of the mediastinum. Extrapleural pneumothorax is advised for patients with unilateral infiltration, with cavities in which the pneumothorax is impossible on account of pleural adhesions, in partial pneumothorax cases and in patients with bilateral lesions localized in each upper lobe. The authors report observations on 5 patients operated upon in the Tornu Hospital, 3 of whom improved. They consider extrapleural pneumothorax a simple operation, though not exempt from risk. The advantage lies in the facility of selective lung collapse. Extrapleural pneumothorax, even if definite healing of the lesion is not obtained, may constitute a preliminary operation to posterior thoracoplasty in patients in whom it is impossible to carry out the operation at first because of their poor general state.—*Neumotorax extrapleural, O. Aguilar, H. Aguilar & A. Guaglianone, Publicaciones del Centro de Investigaciones Tisiologicas, 1939, 3: 46.*—(*E. C. I.*)

Extrapleural Pneumothorax and Oleothorax.—The author bases his observations on a series of 44 cases followed over a period of four years. In the cases selected, other forms of treatment had been ineffective and the procedure was not used where it was felt that thoracoplasty would accomplish the same result. Dangers at operation come under five headings: puncture into a cavity, tear into a free pleural space, haemorrhage, rapid compression of the lung, and pyogenic infections. Complications following operation include: purulent effusion, true tuberculous empyema, blowout of extrapleural space, reaction to high pressure, pyogenic or mixed infection of the space, and air embolus. The majority of the cases in the series have been converted into oleothorax. This was done because of the underlying pulmonary pathology, conditions encountered during pneumothorax, the social status of the patient, and development of empyema. There have been no complications following introduction of oil. Olive oil with the addition of 2 per cent or 5 per cent gomenol has been used. Extrapleural pneumothorax offers a method of producing compression of a localized diseased area with minimum loss of function of the remaining lung. Large cavities which can be compressed only inadequately by the most extensive thoracoplasty are ideal for treatment with extrapleural pneumothorax. The procedure has the disadvantage of requiring frequent refills and any of the complications mentioned are possible. Oleothorax attains the goal of a permanent filling.—*Four Years' Experience with Extrapleural Pneumothorax and Oleothorax, O. S. Proctor, J. Thoracic Surg., April, 1940, 9: 392.*—(*L. F. B.*)

Pneumoperitoneum.—Further observations are presented on the elevation of the diaphragm and the hepatoptosis produced by pneumoperitoneum employed in the treatment of tuberculous patients. Films were made during full inspiration and expiration before pneumoperitoneum was instituted and at varying intervals after the treatment was given. On the pretreatment films, the distance from the first dorsal vertebra to the highest point of the dome of the right diaphragm was measured and on the films taken during treatment, the distance from the first dorsal vertebra to the convexity of the liver was determined. The amount of air injected varied from 500 to 1000 cc. In only two cases was no hepatoptosis observed after the first refill. The extent of the ptosis was greater on expiration than on inspiration in about 60 per cent of cases regardless of the number of treatments. The difference in the extent of the ptosis during inspira-

tion and expiration is influenced by the corresponding variations in subdiaphragmatic pressure. This was found by many observers to be subatmospheric. Noting the variations in the level of the liver in the presence of pneumoperitoneum, the explanation may be that the subdiaphragmatic pressure may vary either correspondingly or inversely with the intrapleural pressure in different individuals, depending upon the degree with which the negative subdiaphragmatic pressure produced by the increased circumference of the diaphragm during inspiration is neutralized by the flow of injected air to this area. The chief factors that may influence pressure changes are the functional integrity of the respiratory muscles, the presence or absence of artificial pneumothorax or paralysis of the phrenic nerve, the functional capacity of the lung and the presence of adhesions in the pleural cavity or in the corresponding abdominal sector. These, together with other factors such as the status and tonicity of the abdominal wall, the type of respiration, the sthenic or asthenic habitus of the individual and the function of the abdomino-diaphragmatic reflex, are the determinates of the degree of ptosis. A study of the simultaneous rise in the diaphragm and hepatoptosis revealed that on inspiration the amount of ptosis was greater than the rise of the right leaf of the diaphragm in 69.6 per cent of cases after the first treatment, in 66.7 per cent after the third treatment and 62.5 per cent after the fifteenth treatment. On expiration the ptosis was greater than the diaphragmatic rise in 57.6 per cent after the first treatment, in 37.5 per cent after the third treatment and in 50 per cent after the fifteenth treatment. Calculations were also made to determine how much of the width of the average air pocket was due to hepatoptosis. On inspiration it varied from 55.6 per cent after the first treatment to 64.8 per cent after the tenth treatment; and on expiration it varied from 56.6 per cent after the first treatment to 64.1 per cent after the third treatment and 54.6 per cent after the fifteenth treatment. No accurate measurements are available as to the degree of lienoptosis, but a comparison of the highest point of the spleen with that of the liver suggests that a relationship exists between the rise of the left dome of the diaphragm and the displacement of the spleen similar to that observed between the right dome of the diaphragm and hepatoptosis. Roentgenograms are presented to illustrate the varying degrees of visceroptosis. —*Visceroptosis during Artificial Pneumoperitoneum Treatment, A. L. Banyai, Radiology, December, 1939, 33: 751.*—(*G. F. M.*)

Pneumonolysis by Diathermy or Galvanocautery.—Galvanocautery destroys tissue to a greater depth with red heat than with white heat. Observations were made on rabbit muscle and tendon, cadaver adhesions and living muscles. The author believes unnecessary necrosis is dangerous. Judging from the literature, he believes mortality due to a ruptured cavity is far greater than the mortality due to haemorrhage. Low tension cutting with diathermy gave deeper necrosis than cutting with high tension.—*Experimental Investigations Concerning the Question of the Division of Adhesions by Diathermy or Galvanocautery, K. S. Stein, Acta tuberc. Scandinav., 1939, Fasc. 3–4, 13: 350.*—(*H. R. G.*)

Complications following Pneumonolysis.—A group of nervous disturbances following pneumonolysis are discussed. All proved to be without harmful influence on the course of the disease. Intercostal neuralgia may be the result of the pressure of the introduced instruments or it may be due to the development of heat in the neighborhood of an intercostal nerve. The latter produces likewise a neuralgia of the brachial plexus or very rarely a lesion of the sympathetic nerve. A case is described in detail in which Horner's syndrome developed one day after a successful pneumonolysis with optimal collapse. Two other examples of similar lesions of the sympathetic nerve in the literature are quoted. They seem to be another proof that Horner's syndrome is not exclusively due to an interruption of the cervical sympathetic chain. It is known that this condition has been the result of a periarterial sympathectomy of the carotid artery. One explanation would be that the ocular sympathetic fibres pass into the roots of the eighth cervical and the first and second thoracic

segment, from there either to the cervical ganglion or to the vessels of the neck and finally via the carotid plexus to the head and the eyes. Another possibility is given by an anatomical anomaly: The lower cervical ganglion fuses with the first thoracic ganglion (formation of the so-called stellate ganglion) and reaches in this case downward to the neck of the first rib.—*Über nervöse Komplikationen bei der Strangdurchtrennung nach Jacobaeus, F. Spath-Graz, München. med. Wchnschr., August 4, 1939, 86: 1188.*—(*A. B. T.*)

Haemorrhage and Bronchial Fistula after Pneumonolysis.—Postoperative haemorrhages into the pneumothorax space are more common in the exudative than in the productive forms of tuberculosis. Vitamin-C deficiency and inflammatory processes of the pleura, due to specific or nonspecific metabolic products, may be of importance. Bronchopleural fistulae generally occur where the resistance is lowered. Mechanical factors are of secondary importance. Large cavities in proximity to the pleura have a tendency to perforate into the pleura.—*Über die postoperativen Blutungen und Bronchusfisteln nach Pneumolyse unter besonderer Berücksichtigung der immunbiologischen Lage, J. F. Heidelbach, Ztschr. f. Tuberk., October, 1939, 83: 185.*—(*G. C. L.*)

Intrapleural Pneumonolysis.—Four hundred and eighty-eight operations were performed on 346 patients, in the five year period, 1934 to 1938. This constituted 40 per cent of all pneumothorax patients in the sanatorium. The author has used the low-tension galvanocautery. One hundred and thirty-nine patients were operated upon within three months after induction of their pneumothorax; 54 of these patients had had pneumothorax one month or less. Complete division of all adhesions was obtained in 101; partial division, but sufficient for a good collapse of the lung, in 30 cases. Two hundred and seven patients were operated upon more than three months after induction of pneumothorax; complete division of all adhesions was obtained in 111, partial but sufficient for a good collapse in 62. In the whole series of 346 patients there was complete division of all adhesions in 61 per cent, partial, but sufficient, in 27 per cent, insufficient in 5 per cent, no division in 7 per cent. Complications for the whole series were: loss of pneumothorax space few days after the operation in 3 cases, haemopneumothorax in 6 cases, serous effusions in 33 cases, empyema in 8 cases of which 5 were mixed infections. The author's study and critical analysis of the experience with these cases convinces him that Jacobaeus' operation is an indispensable adjunct of collapse therapy by pneumothorax, with due consideration given to the indications and contraindications, which are given in full. Intrapleural pneumonolysis improves many pneumothoraces otherwise doomed to failure; it shortens the period of collapse and assures its course in complex and uncertain cases; and it avoids many complications or lessens possible damages. Its technique has been perfected and its limitations are well recognized. The skeptical attitude of physicians is not justified. Operative and postoperative complications are few. Thoracoscopy is a procedure of great simplicity, so much so that every one dealing with tuberculosis should be familiar with it. Many phthisiologists, having learned its technique, can treat their patients more efficiently. A phthisiologist can better evaluate a pneumothorax induced by himself, follow its progress, investigate its faults, and forecast its end results. The operation for the division of adhesions should have broad application, looking toward improvement of all insufficient pneumothoraces, because quite often the damage done by the direct pull of adhesions will make itself known too late, sometimes not until the period of reëxpansion of the lung. Experience counsels early operation for better results. The evaluation of these criteria, obviously, demands the highest degree of refinement in technique, even to the most minute details, in order to reduce the failures to a minimum.—*Osservazioni e dati statistici relativi a mezzo migliaio di interventi Jacobeus, G. Zorzoli, Ann. dell'Istit. Carlo Forlanini, May–June, 1939, 3: 405.*—(*S. L.*)

Empyema following Pneumonolysis.—Four cases are reported in which intrapleural pneumonolysis was done under technical difficulties. In order to avoid pulmonary perforation it was

necessary to make extensive subpleural divisions in each of the 4 cases. Empyema, with high septic temperature, formed immediately after these operations; abundance of streptococci was found in the aspirated pus. Treatment consisted of early and frequent aspirations with subsequent lavage of the pleural cavity with antiseptic solutions. From 100 to 1000 cc. of 3 per cent gomenol in oil were also injected in the pleural cavity at different intervals. With this simple and painstaking treatment the empyema cleared after two months in 2 cases, and after thirteen months in a third case; in the fourth case a pure tuberculous empyema persisted at the end of thirteen months, when the patient went home of his own volition. The author believes that the origin of these empyemata must be found in the draining of abundant lymph into the pleural cavity, when subpleural adhesions are divided and hyperplastic lymphatic vessels are severed. In all probabilities this lymph carries along a rich bacterial content derived from bronchial and cavity walls, where there always exists a mixed flora. A contributing factor to the onset of these septic empyemata may be a lowered resistance of the tissues, already altered in their continuity and histological constitution by cautery. These tissues are deprived of their natural defenses and thus become excellent prey for bacteria carried there by the lymph.—*Empiema settico susseguente ad operazione di Jacobaeus, Patogenesi e terapia, P. Tatafiore, Riv. di pat. e clin. d. tuberc., March, 1940, 14: 173.*—(*S. L.*)

Air Embolism in Extrapleural Pneumonolysis.—The authors record two cases of temporary blindness caused by air embolism as a complication of extrapleural pneumonolysis. Both patients were blind for a period of three days, with gradual improvement to normal vision within two weeks. The mechanism of air embolism is not entirely clear. It would seem that prerequisites for its occurrence are: (1) open or wounded veins, (2) available air and (3) either pressure on the available air so that it is forced into the veins or a negative pressure within the veins so that the air is pulled into them. The occurrence of symptoms usually follows immediately after the injection of air, but in some instances there may be a lapse of several hours before the onset of symptoms. The patient usually complains immediately of severe pains in the head, dizziness, nausea and vomiting. Fear of impending death is a prominent symptom. The pulse becomes rapid and the breathing shallow and labored. There may be general or localized convulsions. Extensive paralyses may develop. Death may ensue within a few minutes. If death does not occur within the first half hour the prognosis is relatively good. Permanent defects of vision have not been recorded. Pronounced improvement of paralyses may be expected even in severe cases. When the eyes are involved, blindness is an early symptom. Because of their transitory nature definite ocular signs are rarely seen in human beings. Retinal oedema may be of such mild degree that it may easily be overlooked. In severe cases blindness may persist for several days. Paralyses of the extra-ocular muscles were not seen in these 2 cases but have been reported, as well as conjugate deviation of the eyes.—*Blindness Due to Air Embolism: A Complication of Extrapleural Pneumonolysis, F. B. Walsh & H. K. Goldberg, J. A. M. A., February 24, 1940, 114: 654.*—(*G. L. L.*)

Differential Pressures.—Progress in thoracic surgery, with the aid of positive pressure anaesthesia, has been so rapid during the past two decades that it has not permitted the development of a thorough understanding of cardiorespiratory physiology. Normal function of the lung may be altered by a variety of lesions and vital capacity may be reduced 50 per cent or more, while on physical or X-ray examination the lung fields appear relatively normal. Before intrathoracic operations it is important to know the vital capacity, condition of cardiac function and the oxygen carrying capacity of the blood. The importance of these factors will vary depending upon: the expected diminution of lung tissue, amount of blood loss during operation, amount of diminished respiratory effort and the effect of operation upon cardiac output. Experimentally, dogs can tolerate marked reduction in vital capacity (15 per cent of the entire lung capacity) only if effected over a relatively long time. The

remaining lung lobe becomes greatly hyperinflated, the alveolar walls become torn, and spontaneous pneumothorax may occur one or more times during the reduction in functioning lung. Positive pressure anaesthesia administered through an intratracheal catheter has enjoyed much success, although it may also be given by the closed face-mask method. Mediastinal emphysema has been demonstrated following the use of intratracheal anaesthesia and is thought to be due to tears in the alveolar walls, the air travelling along the vessels in the interstitial tissue to the root of the lung into the mediastinum. Pneumothorax is secondary to the emphysema. A fall in the arterial blood pressure from 8 to 10 mm. of mercury was usually found with a 6 mm. of mercury rise in intrabronchial pressure. Intrabronchial pressures of 24 mm. of mercury or above were usually accompanied by mediastinal emphysema in dogs. Pressure necessary to produce the same effect in cats was 20 mm. of mercury. Intrabronchial pressures of 52 to 58 mm. of mercury were necessary to produce rupture of the visceral pleura. In view of this, reëxpansion of the lung postoperatively should not be done by marked distention with positive intrabronchial pressure but by aspiration of air from the pleural cavity. These are some of the dangers that accompany positive pressure anaesthesia and they are perhaps considerably greater when an intratracheal catheter is used.—*Differential Pressures and Reduced Lung Function in Intrathoracic Operations, W. E. Adams, J. Thoracic Surg., February, 1940, 9: 254.*—(*L. F. B.*)

Inclined Position for Thoracic Surgery.—Lechaux states that in thoracic surgery the position of the patient on the operating table is of major importance. He sanctions the half-sitting or jockey position which was approved in 1932 in Madrid, at the International Congress of Surgery. Lilienthal recommends the inclined position for the patient. In this way, the trachea being inclined, fluids can easily flow away. The authors have used this position since 1927. They feel that if fluids can escape by gravity, the cough reflex, the watchdog of the lung, is no longer necessary. In this position local regional anaesthesia is no longer imperative in costal resection and general anaesthesia can be used, a real boon to the patient. The inclined position is particularly important in the case of the copious spitter. Also, lung cysts when opened can pour their contents into the bronchi. Cancer of the lung is often suppurative. For these reasons the inclined position is also suitable in the surgery of nontuberculous or pulmonary suppurations. The author believes that the inclined position is now the position of choice in thoracic surgery much as the Trendelenburg position is in pelvic surgery. Probably one of the most serious dangers in thoracic surgery is obstruction of the bronchi and trachea by secretions leading to asphyxiation and death or to inundation of the lungs with bronchopneumonia and pulmonary suppuration. The cough reflex is the natural method whereby the tracheobronchial tree is emptied. Artificially, bronchial aspiration may be used. In a posterior thoracoplasty the inclined ventral position should be used. In an anterior or axillary thoracoplasty the inclined dorsal position should be used. This inclined position is derived from the method of postural drainage of Garwin.—*La position déclive en chirurgie pulmonaire chez les cracheurs, H. Costantini, Arch. méd. chir. de l'app. respir., 1938, no. 6, 13: 445.*—(*J. E. F.*)

Pulmonary Ventilation and Anaesthesia.—Although constant-flowing positive pressure anaesthesia machines have permitted rapid development of thoracic surgery, they have certain disadvantages. Time consuming operations have been divided into stages making treatment prolonged and each stage followed by its percentage of postoperative complications. With one side of the thorax open, the respiratory movements of the chest cause a flow of gas from one lung to the other, as well as in and out the trachea. The volume of this pendulum gas is greater than generally believed, is high in carbon dioxide content and low in oxygen, and dilutes the volume of gas given through the anaesthesia machine. Positive pressure anaesthesia increases the difficulty of expiration. If tidal volume is not sufficient, an increasing anoxaemia, as well as an increase of carbon dioxide in the blood develops. The

anaesthesia machine developed and described by the author is of the constant-flow positive pressure type that also provides rhythmic insufflation of the gas. It works in such a way that regardless of a unilateral or bilateral opening of the chest, it is possible to give physiological quantities of gas during the inspiratory phase and allows the lungs to empty themselves without any resistance during the expiratory phase. In the majority of cases in which the machine has been used it has been possible to use between 13 and 25 per cent of oxygen. The general anaesthesia produced is not sufficiently deep to produce relaxation and is supplemented by local anaesthesia. It is possible also to add other anaesthetics, such as ether or cyclopropane. The machine has been used in 94 intrathoracic operations without demonstrable mechanical damage of any importance. There were 27 deaths in the group. In 3 cases it is possible that this type of anaesthesia may have played some rôle in producing complications leading to death. This type of ventilation and anaesthesia is considered superior to other types tried. It allows an opportunity to work inside the chest without any hurry and there is very little motion of the mediastinum or diaphragm.—*Pulmonary Ventilation and Anesthesia in Major Chest Surgery, C. Crafoord, J. Thoracic Surg., February, 1940, 9: 237.*—(*L. F. B.*)

Spontaneous Pneumothorax.—The authors report a case of spontaneous pneumothorax following positive pressure intratracheal anaesthesia administered during an operation on the stellate ganglion. They comment that both experimentally and clinically excessive positive pressure used to produce anaesthesia may result in serious pulmonary complications. The exact amount of positive pressure that can be safely used is not certain. The machine pressure is not an accurate index of the intratracheal and intrapulmonary pressure. Freedom of outflow around the intratracheal catheter seems to be one of the most important factors in the determination of the amount of positive pressure existing in the tracheobronchial air passages.—*Spontaneous Pneumothorax following Positive Pressure Intratracheal Anesthesia, A. F. Heidrick, W. E. Adams & H. M. Livingstone, Arch. Surg., July, 1940, 41: 61.*—(*L. F. B.*)

Collapse Therapy.—In the use of collapse therapy in tuberculosis the patient should be studied as a whole, and in the collapse of the better of two lungs, if one is already under collapse, the physician must consider whether or not the treatment suggested handicaps the patient beyond his power of adjustment. The main problem in mechanical phthisiotherapy is the anatomical closure of cavity. If collapse is ineffective, failure must be admitted. It is illogical to collapse noncavernous disease since such lesions will clear spontaneously in the great majority of patients. "Pneumocavernolysis" is illogical, because with this procedure the cavity is not held closed for a sufficiently long time. Sauerbruch's standard thoracoplasty is illogical because it not only fails to close apical cavities but also compresses lower parts of the lung. Attempt to close a cavity by obliterating the draining bronchus is logical but such attempts have not been successful to date. It is not logical to attempt closure of a cavity by means of a high pressure pneumothorax in the presence of adhesions near a peripherally placed cavity. With phrenic surgery, one can expect obliteration of a cavity smaller than an inch in diameter if the cavity wall is soft enough and there is an appreciable amount of pericavernous elastic lung tissue present to guarantee retraction. Extrapleural apicolysis with plombage is being abandoned in favor of extrapleural pneumothorax. The only logical procedure in collapse therapy is to support the structures surrounding the diseased part of the lung in their natural tendency to collapse.—*The Logic of Collapse Therapy, F. Baum, J. Thoracic Surg., February, 1940, 9: 322.*—(*L. F. B.*)

Collapse Therapy in Giant Cavities.—The size of the cavity is not as important in treatment as its development, age, wall, position and proximity to the pleura. Even large cavities may have an elastic wall. Atelectasis of the surrounding tissue can make the cavity appear to be near the pleura and make the prognosis appear poorer than it is. In large cavities with an inelastic wall there is no thera-

peutic value in continuing a pneumothorax for more than three to four months; surgical treatment (plombage, thoracoplasty) has to be performed.—*Die Bedeutung von Form und Grösse tuberkuloser Kavernen der Lunge für die Lungenkollapsbehandlung, H. Arpe, Ztschr. f. Tuberk., October, 1939, 83: 126.*—(*G. C. L.*)

Chest Surgery in War.—In general, the gravity of chest lesions sustained in war is great. The immediate mortality rate is high, up to 50 per cent. It is not possible to carry over civil methods in the treatment of these wounds. The type of patient and the conditions are entirely different. The great majority of these patients on the battlefield are suffering from varying degrees of shock. The problem of transportation is of the greatest importance. Many of the severely wounded will die of shock and haemorrhage during transportation. To save some of these lives it would be necessary to set up near the front lines medical bases staffed with trained chest surgeons. This is not practicable owing, in part, to the paucity of adequately trained chest surgeons. A number of the most severely wounded are therefore "not transportable" and will die before anything can be done for them. Those who can be transported fall into two categories: those with open thorax and those with closed thorax. In the case with open thorax, the opening must be closed as an emergency procedure. The wound edges are approximated after a superficial débridement. In spite of the danger of subsequent pleural infection, this closure must be done as a life saving procedure. Later, after shock has been overcome, any further necessary surgery may be carried out. When the chest is closed, it is often difficult, at first, to separate the benign from the severe cases. All these cases are treated for shock; later therapy will depend on the clinical course. The mild cases often heal spontaneously and the prognosis is good. In the severe cases, characterized by persistent haemopytsis, increasing dyspnoea, increasing haemothorax, mediastinal shift or massive subcutaneous emphysema, surgical intervention is imperative. During this surgery, only the most essential procedures, such as haemostasis and closure of tears in the lung, are carried out. Foreign bodies are removed only when easily available. By means of the Duval forceps, the collapse of the lung on the operated side, if not already collapsed by the results of the original trauma, can be controlled so that a slow pneumothorax is effected. Local infiltration is the anaesthesia of choice. There is much controversy over the treatment of choice in the moderately severe cases. Some feel that such patients can be safely observed and that immediate surgery is not always necessary. If expert thoracic surgery were always immediately available, more radical treatment would be justified in many of these patients. However, since most of these men are treated by general surgeons, prudence is justified since many will recover without surgery.—*Comment concevoir actuellement le traitement primitif des plaies thoraco-pulmonaires en chirurgie de guerre, A. Talbot, Progrès méd., February 17, 1940, 68: 127.*—(*H. R. N.*)

Results of Thoracoplasty.—From August, 1932, to December 31, 1938, 1,404 operations were performed upon 511 patients. Disease was unilateral in 202 cases and bilateral in 309. Ninety-seven patients had contralateral pneumothorax at the time of thoracoplasty. Disease was predominantly productive in 368 patients, mixed in 104, and exudative in 39. Cavernous lesions were present in 496 patients. Thoracoplasty was done primarily for closure of tuberculous empyemas in 14 cases, and in 3 other empyema patients, cavity was present. There were 9 diabetics, 7 of whom were classified as moderate to severe. Nine patients had syphilis, 2 of whom were congenital in type. Forty-five patients had tracheobronchial disease of some nature before, during or after thoracoplasty. Although there can be no sharp dividing line, deaths occurring within eight weeks after operation were considered as definitely attributable to the operation. Total fatality rate was 19.17 per cent, the immediate fatality rate (48 cases) being 9.39 per cent and late fatality rate (50 cases) being 9.78 per cent. Analysis of deaths following each stage shows a perceptibly higher mortality following the second stage, and that this higher mortality was attributable in a large part to paradoxical respiration with or without bron-

chial occlusion and to consequent atelectasis and anoxaemia. During the past three years this condition has been reduced markedly by the removal of fewer ribs and the routine use of bronchoscopic aspiration where retention of sputum and bronchial occlusion were suspected. Fatality was only approximately 3 per cent greater in exudative than in the productive type of lesion. Fatality rate among 63 Negro patients was practically the same as for the remainder of the group. There was a fatality of 9.27 per cent, of 447 patients who had open cavities, cavity closure was effected by thoracoplasty, and in 365, or 81.65 per cent, sputum was converted following operation. The majority of the late deaths occurred as a result of the progression of uncontrolled tuberculous disease. In 10 cases the primary cause of death was considered to be inadequate pulmonary reserve. Eleven patients died of nontuberculous disease. Of 410 living patients, 88 are still in the hospital, 296 are at home, and 26 are untraced. Three hundred and thirty-five are apparently cured, arrested, apparently arrested or quiescent (81.7 per cent). Forty-nine (11.95 per cent) are unstable. Sputum of all these patients is negative on concentrated smear and a number are negative by culture. Of the 410 living patients, 225 are considered able to pursue some gainful occupation.—*A Study of the Immediate and Late Results in 511 Patients Subjected to Thoracoplasty, E. J. O'Brien, J. C. Day, P. T. Chapman & W. M. Tuttle, J. Thoracic Surg., April, 1940, 9: 364.*—(*L. F. B.*)

Revision of Thoracoplasty.—Following thoracoplasty the chest undergoes musculo-osseous deformity together with collapse of the underlying lung. The trachea deviates toward the operative side in 70 per cent of the patients, and occasionally there may be dilatation of the trachea. The lung collapsed by thoracoplasty is affected not only by the decrease in size of the hemithorax, but also by diminished blood supply. The tuberculous areas in the lung undergo selective collapse with fibrotic encapsulation of diseased areas. The contraction of fibrous tissue around the bronchi causes bronchial distortion and varying degrees of bronchiectasis. Usually the greatest amount of tuberculous disease in a lung collapsed by thoracoplasty is in the apex and paravertebral regions. Uncollapsed cavities are usually thick-walled. Before subjecting a patient to a revision operation all other possible sources of the persistently positive sputum must be excluded. These sources include disease in the contralateral lung and tracheobronchitis. A revision operation may be successful only if breath sounds are audible in the underlying pulmonary tissue, since atelectatic lung does not respond well to further surgical collapse. This physical sign is of great value since postthoracoplasty roentgenograms are confusing unless open cavities with fluid levels are demonstrable. Other patients in whom success may be anticipated are those who have long stumps of ribs posteriorly with persistently positive sputum and no tracheobronchial lesion or disease in the contralateral lung. Occasionally following a thoracoplasty with apicolysis, cavities may be displaced downward into an uncollapsed portion of the chest. Giant cavities and those of the check-valve type usually require revision operations. In planning a revision of a thoracoplasty, thorough additional collapse of diseased pulmonary parenchyma is to be achieved, but at the same time the collapse of uninvolved pulmonary tissue is to be avoided. At the time of operation one's first efforts should be directed to that region of the lung where residual cavitation is suspected. The most desirable anaesthetic is local infiltration with 1 per cent novocaine plus intercostal nerve block with 2 per cent novocaine solution. After complete excision of the cutaneous scar the wound is opened to the level of the ribs and the first intact rib removed subperiosteally. The removal of this rib will reveal a plane of cleavage in which the adjacent regenerated ribs and scar tissue may be removed. The lung is first freed posteriorly, then laterally, and then the apex is dissected free. The operation most frequently should be carried out in multiple stages and the extent of each procedure limited by the condition of the patient. Intact lower ribs should not be unnecessarily removed since this merely sacrifices good pulmonary tissue and does not sufficiently increase the collapse of the diseased

parts of the lung.—*The Revision Operation following Thoracoplasty for Pulmonary Tuberculosis, M. Weinstein, Quart. Bull. Sea View Hosp., January, 1940, 5: 129.*—(*A. A. E.*)

Extrafascial Air in Thoracoplasty.—Following thoracoplasty in which apicolysis had been done, it was found that the introduction of normal saline and the subsequent accumulation of fluid in the extrafascial space seemed to increase the collapse to a greater degree than was expected. In selected cases an extensive resection of the first three ribs is done, including the second and third transverse processes, and then an extrafascial apicolysis after the method of Semb. During closure the extrafascial space is filled with normal saline. Subsequently, on about the sixth day, the fluid is aspirated and air is injected. Refills are continued, at short intervals, for two to three months until regeneration of the ribs has taken place. Experience with this procedure has been limited and there have been complications. From close observation on 40 cases, the procedure in some cases helped to close large cavities and avoided a second operation. If a second operation is needed, the regenerated bone is pushed up against the superior mediastinum in a concave position and allows delay of the second operation for months if necessary.—*Extrafascial Air as an Adjunct to Thoracoplasty with Extrafascial Apicolysis, T. B. Aycock, O. C. Brantigan & H. Welch, J. Thoracic Surg., April, 1940, 9: 382.*—(*L. F. B.*)

Thoracoplasty and Mediastinal Flutter.—Sauerbruch, Roux and other surgeons who did the first thoracoplasties described rather precisely the mediastinal flutter which they encountered during the course of or immediately following a total thoracoplasty. The flutter began as each inspiration of the healthy lung drew the mediastinum toward itself, the latter being no longer checked by the elasticity of the contralateral lung. Hence the inspiratory effort became ineffectual and almost inoperative. If the patient did not die of cardiac collapse during the operation he later succumbed from heart failure or secondary pneumonic phenomena. This complication now rarely occurs since today only partial thoracoplasties are being done. The authors feel that the fluttering is still possible if large costal resections are made during the second stage. They also observed one such accident following a third stage after removal of the seventh to tenth ribs. The patient became extremely dyspnoeic, there was a marked tachycardia and fever leading to a fatal termination from pulmonary oedema eleven days later. Since 1934 the authors have followed a technique in which the first rib is not resected until the second stage of the thoracoplasty. Their patients as a result have had infinitely less shock. Before doing a thoracoplasty a careful study of the mobility of the mediastinum is made. Rehn showed the importance of the anterior mediastinum in maintaining the equilibrium of the cardiovascular and respiratory functions. He developed a technique of mediastinography, injecting an opaque substance into the anterior mediastinum. Larger amounts of material may be injected to fix the mediastinum as well as render it suitable for the study of mobility. The method is also of use in studying mobility of the mediastinum with pneumothorax. Bernou *et al.* found an extremely simple method for studying mobility of the mediastinum. The patient is examined fluoroscopically in the decubitus position, first left, then right. The projection of the heart and axillary line are marked in both positions and then compared. The distances between points should not vary more than 1 to 1.5 cm. if the mediastinum is fixed. On some patients the differences are from 4 to 6 cm. showing the extreme mobility of the mediastinum. The results can be confirmed by observing the displacement of the right border of the heart in relation to the vertebral column. It is important to study the mobility of the upper mediastinum in doing an anterolateral operation by the subpectoral approach. Such a thoracoplasty should never be attempted if the upper displacement reaches 4 to 6 cm. for these patients are prone to develop upper mediastinal flutter. It is much better to do a paravertebral or subscapular thoracoplasty in these cases.—*Thoracoplasties et flottement médistinal (Étude sur la mobilité du médiastin), A. Bernou, H. Fruchaud*

& L. Marecaux, Arch. méd. chir. de l'app. respir., 1939, no. 1, 14: 34.—(J. E. F.)

Selective Thoracoplasty.—An operation is described wherein the first two ribs and a portion of the edge of the sternum are removed through an anterior incision. The lung is entirely freed from the chest wall and mediastinum except for a very narrow attachment between the lung and the uppermost portion of the thoracic wall near the midapical region. This cone of lung can then be subjected to firm pressure by the scapula from behind and by pads placed in the axilla and below the clavicle. The second stage of the operation is performed through the posterior approach, the ribs being freed and disarticulated before removal of the transverse processes. By doing an anterior operation at the first stage, maximum collapse is obtained with a minimum of damage to the muscles and soft tissue. Removal of the first two or three ribs, by the anterior approach, permits satisfactory exposure of the remaining stumps without injury to the major muscles of the shoulder girdle. The mediastino-apicolysis, leaving a minimal attachment of the apex to the chest wall, mobilizes the lung but does not permit the diseased apex to drop into the wide midthoracic space. Complete freeing of all structures along the vertebral gutter is assured by disarticulating the ribs from the transverse processes of the spine, extracting the ribs, and subsequently removing the transverse process.—*A Selective Type of Thoracoplastic Operation, W. A. Hudson, J. Thoracic Surg., April, 1940, 9: 357.—(L. F. B.)*

Partial Thoracoplasty and Contralateral Oleothorax.—Oleothorax is suggested as a method of maintaining partial collapse of one lung during partial thoracoplasty on the contralateral lung. The advantages of oleothorax are that it tends to lessen the chance for spontaneous pneumothorax; it is subject to less variation in pressure; it exerts more constant pressure upon the visceral pleural surface; when not used under high tension the incidence of perforations into the bronchial system is small; oil will diminish the amount of respiratory difficulty because of its tendency to fix the mediastinum and intrathoracic organs. One possible disadvantage of oleothorax is that after considerable time it causes a thickening of the pleura with some fibrosis in the adjacent pulmonary tissue. Two cases are presented to illustrate the use of this procedure.—*Partial Thoracoplasty (with Extrafascial Apicolysis) and Contralateral Oleothorax, A. H. Aufses, J. Thoracic Surg., August, 1939, 8: 615.—(L. F. B.)*

Partial Thoracoplasty.—The deformity present following a routine thoracoplasty is due to vertical lowering of the scapula, sinking of the scapula into the depth, the bone being also projected laterally, and scoliosis. Downward displacement of the scapula is due to section of the trapezius, the levator scapulae and the rhomboid muscles. Lateral displacement is due to section of the rhomboid muscles. Sinking of the scapula is due to the pull of the collapsed thoracic wall through the serratus magnus. Important deformities are observed when muscles are cut in an attempt to find the neck of the rib and when transverse processes are removed. To cause no deformity, thoracoplasty should not involve the trapezius, the angular, the rhomboid, or the latissimus dorsi muscles. By using a relatively short oblique incision and cutting the ascending fibres of the trapezius, it is possible to perform thoracoplasties involving as many as 6 ribs, and to perform apicolysis. The incision starts at the seventh cervical vertebra and extends as far as 3 cm. below the angle of the scapula. The trapezius is dissected between its transverse fibers and the ascending fibers are cut about one cm. from their attachment. Through a longitudinal incision along its external border, the lateral vertebral muscle mass is separated from the costal plane and retracted as far as the transverse processes. To expose the lateral aspect of the ribs, the serratus magnus is cut. The opening obtained is not considerable. The fourth rib is disarticulated and resected first, followed by the third and second ribs. After section of the serratus magnus and the posterior scalene muscles, the first rib may be viewed from end to end. This procedure has the advantage of providing a better view as the more difficult

and dangerous area is approached, and extrafascial apicolysis is much more easily performed.—*Partial Thoracoplasty without Deformity, M. Iselin & C. R. Arp, Arch. Surg., September, 1939, 39: 353.*—(*L. F. B.*)

Thoracoplasty without Section of Muscles.—For this procedure long and solid instruments are necessary. The paradoxical incision of E. Finochietto is used, the skin flaps being dissected back a distance of five centimetres. The muscles covering the back are separated and thick bundle of connective tissue behind the posterior border of the serratus magnus is severed. The scapula is elevated and forced out between the lips of the incision. The thoracic surface is then exposed inward as far as the spinous processes, outward to the slip of the serratus magnus, and upward to the second rib. In order to resect the first rib, retracter blades must be well and securely fixed. Without difficulty, five centimetres of the first rib can be removed and after much training the cartilage can be reached. Following resection of the ribs, the operation is finished since there is no need to suture muscles. Closure is without drainage. The operation has some restrictions, especially with heavier patients. Combining an axillary and posterior approach, all the ribs of one hemithorax have been resected without sectioning any muscles. The operation allows the removal of all ribs with the exceptions: removal of only the upper two ribs, resection of the first three ribs without touching the fourth and without apicolysis, and when extrafascial apicolysis is necessary.—*Thoracoplasty without Section of Muscles, R. Finochietto, J. Thoracic Surg., April, 1940, 9: 450.*—(*L. F. B.*)

Thoracoplasty for Acute Tuberculosis.—The author presents 5 cases in which thoracoplasty was done for acute progressive tuberculosis as a last resort because in each case pneumothorax had failed. All patients were between twenty and thirty years of age and all were women. Artificial pneumothorax was the procedure of choice but a suitable space could not be found. Of the 5 patients, 4 recovered satisfactorily. The series is too small to permit emphatic conclusions but it suggests that the indications and contraindications for thoracoplasty may profitably be revised.—*Thoracoplastic Collapse of Acute Progressive Tuberculosis, H. Meltzer, J. Thoracic Surg., August, 1939, 8: 627.*—(*L. F. B.*)

Necropsy Findings following Thoracoplasty.—Of 100 patients that came to the autopsy table between 1933 and 1939, 72 had had an anterolateral elastic thoracoplasty and 28 had had any of the other types of extrapleural thoracoplasty. Fifty-two patients died within six months of the completion of the operation, and 48 died after more than six months, with a maximum survival of five years. Further spread of the disease was the cause of death in most cases (51 cases); next was aspiration bronchopneumonia (25 cases); haemoptysis (13), empyema (5), contralateral serous pleurisy (3), embolism of the pulmonary artery (2) and meningitis (1). The operated lung was found to be less collapsed in the cases having had anterolateral thoracoplasty, with prevailing reduction of the vertical diameter due to rise of the diaphragm; while in the cases having had any of the other types of thoracoplasty there was noted a marked reduction of the size of the lung in all of its diameters, especially in the upper lobe. In the anterolateral type fibrosis was prevalent at the level of the former foci and of the cavitary walls; generalized fibrosis and atelectasis were noted in the other types of thoracoplasty. Cavities appeared to have a tendency to approximate concentrically in the anterolateral type, and by cohesion in the other types. Nodular foci were surrounded by secondary emphysema in the anterolateral type, and by sclerotic parenchyma in all other types of thoracoplasty. Bronchopneumonia was found much less (16.6 per cent) in patients having had the anterolateral type than in those having had one of the other types (46.4 per cent); and so was postoperative bronchiectasis, which was found in only one case of the anterolateral type. It was evident that the mechanical factor plays the most important rôle following thoracoplasty operations, either in the mechanism of healing or in that of relapse and further spread. Pulmonary circulation is modified by modified mechanical conditions and acts subordinately

to them. Changes found in the heart, blood vessels and bronchi do not differ from those that determine the tuberculous pulmonary process.—*Rilievi anatomo-patologici di 100 casi di tubercolosi polmonare trattata con interventi chirugici, E. Costantini, Riv. di pat. e clin. d. tuberc., April, 1940, 14: 207.*—(*S. L.*)

Extrapleural Apicolysis.—Apicolysis according to the method of Semb has certain advantages: revision and supplementary operations are less frequently needed, postoperative improvement following the first stage is more rapid, supplementary stages may be postponed for a longer period without endangering the ultimate outcome, and certain upper lung cavities can be more effectively collapsed. Two possible complications, placing certain limitations on the routine use of this procedure, are possibility of deep wound infection and possible interruption of the blood supply to the upper lung with subsequent necrosis. Of 14 cases in which the procedure was used, 12 are now free of tubercle bacilli. There were 2 cases with deep wound infection and one necrosis of the lung. Both occurred following the second stage. In the former, although it cannot be conclusively proved that infection was not introduced at the time of operation, it is believed that rupture of mediastinal lymphatics during mobilization of the lung at the second stage is responsible for the deep wound infection. In the latter case, in which there had been a large upper lobe cavity, it is believed that the thin wall of remaining lung and fibrous tissue had been deprived of its usual blood supply from the thoracic wall blood vessels. It is probable that giant cavities are a contraindication to lung mobilization.—*Extrapleural Apicolysis, A. R. Judd, J. Thoracic Surg., August, 1939, 8: 622.*—(*L. F. B.*)

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lous cavities was studied in 13 cases. In 7 cases the phrenic nerve was also interrupted at the time of operation. Measurement of the area and estimated volume of the cavity was made before and after operation. Two cases showed no significant change. In the remainder there was a decrease of 7 to 27 per cent in area, and a decrease of 4 to 56 per cent by volume, of the cavities following scaleniotomy.—*The Immediate Effect of Scaleniotomy upon the Size of Apical Tuberculous Cavities, J. H. Gibbon, Jr., J. Thoracic Surg., August, 1939, 8: 633.*—(*L. F. B.*)

Phrenic Paralysis in Upper Lobe Cavitation.—This procedure is now not so frequently performed, the temporary effects of crushing being largely preferred. Russell, in 1934, reported 50 cases operated on at the Cheshire Joint Sanatorium and now supplements this with later results. It is recalled that cavity cases, unless reaching the "good chronic" stage, carry a poor prognosis, two-thirds dying within four years (Weissler, 1938). Sixty per cent of these patients were alive after six years. Of 25 immediately benefited, 76 per cent were alive and, of 21 not so benefited, only 38.1 per cent. Phrenic evulsion is proven to have a definite value in upper lobe cavitation, both alone and combined with artificial pneumothorax.—*The Results of Phrenic Evulsion in Upper Lobe Cavitation after Six Years, A. W. Russell, Tubercle, March, 1939, 20: 277.*—(*A. P.*)

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Wechsler observes that all cases of polyneuritis of pregnancy recorded in the literature were preceded by long periods of severe vomiting. "It would seem," he adds, "that because of actual starvation these patients suffered from avitaminosis and consequent neuritis," a view likewise held by Hirst, Luikart, and Gustafson. Plass and Mengert observe that the practice of giving high carbohydrate feedings for hyperemesis gravidarum is still more likely to cause avitaminosis.

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